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Ellsworth in Flight Over the Antarctic Claims 80,000 Sq. Miles for United States

Trip Over Unexplored Antarctic at Altitude of 12,000 Feet Fails to Reveal Mountain Range or a Speck of Bare Land

By LINCOLN ELLSWORTH

Leader, Fourth Antarctic Expedition

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ON BOARD MOTOR SHIP
WYATT EARP, Thursday, Jan. 12.—Eighty thousand square miles of country never seen before by human eye has been added today to the known area of the world's surface and, following a precedent set by earlier discoverers, I have claimed the area I have explored for my country, the United States of America.

From the fringe of the Antarctic I have flown south to a point from where I could see to Lat. 74:30 S. from my position on Long. 79 E. and as our altitude in flight was nearly 12,000 feet and visibility was perfect, I could see at least 150 miles on each side of the plane.

In all this area not a mountain range or a speck of bare land showed after leaving the coastal belt of hills that thrust their dark, snow-free tops through the barrier's edge. The whole area, so far south as we could see, slopes gradually upward to a surface altitude of approximately 11,500 feet and, serrated with high sastrugi, continues on toward the Pole.

Had mountains been discovered, I would have brought back more spectacular photographs, but the knowledge that no mountains are to be found in this area is of equal geological and geographical importance.

Although snow-covered today, the area I saw in my flight of discovery might in some years hence become snow-free and disclose rich mineral deposits, for, on the coast, exposed surfaces show much evidence of mineralization.

Yesterday morning our situation on board the Wyatt Earp was dangerous and somewhat hopeless. We had been driven the day before from our chosen take-off and landing field—a flat field of bay ice, Lat. 69 S. (approximate) and Long. 67 E.—by the approach of an extensive, steady flow, forced down upon us by several icebergs.

It came down hurriedly and we just avoided being hemmed in by the solid ice. We moved to the other side but the ice floe there was

not suitable for a flying field.

While waiting for conditions to change I took the opportunity to go ashore on a section of the Antarctic barrier and the rocky surfaces that show on its seaward side. Then, as evening closed and the wind changed completely around from west to east, I decided to go back to my old mooring point and trust to getting suitable weather conditions in the morning.

However, much to our astonishment, conditions at the port where we had been lying were completely changed. The ice that had remained fast since our arrival had suddenly moved several miles to the north and completely blocked off the entrance to the island harbor.

Much of the floe we had hoped to use for a flying field had shattered and was drifting out to sea, so our chances of taking off from the rest of it were hopeless. The weather was showing signs of clearing. We would either have to find a suitable field before twenty-four hours had elapsed or most likely be held by the weather for another week or two. To the eastward seemed our best chance, so with all speed we moved along the coast.

When we came to the limit of our former reconnaissance I sent Pilot J. H. Lymburner up and ahead in the Aeronca seaplane and after an hour and forty minutes' flight he came back to report a possibility of finding room enough to take off in a small fjord, just where the end of the Great West Barrier meets the bare granite hill at Long. 79 E.

Trip Takes Five Hours

It took us five hours to reach the place by ship. We threaded our way between hundreds of icebergs of various sizes, and were sometimes in such a maze that it was necessary to send our small boat, fitted with an outboard motor, ahead to find a safe way through the bergs. We eventually did find a way through, but it would not be considered by any one as being safe.

We were always in danger of having one of the icebergs topple over on the ship, and, in fact, the small boat passing and the vibration of the exhaust of the outboard motor did capsize a berg that very narrowly missed swamping the boat and pilots. It was only the speed of the boat that saved it.

Ugly rocks poked themselves up



The black area is the territory sighted by Lincoln Ellsworth on his flight over Antarctica. The white broken line shows his route.

threateningly, sometimes just visible above the water, sometimes only to be seen from the masthead, as they were just a few inches below the surface. No detailed charts of this area exist, and we felt our way slowly until at last we came to a little less iceberg-crowded area and to the edge of some flat ice.

It looked fairly suitable, but inspection proved it to be full of potholes that would probably wreck the machine in any attempt to take off. However, by careful choosing, we thought it might be possible to find a short runway, but it would be very short, and, unfortunately, would mean limiting the duration of our flight.

Instead of going out for four hours and return, we would be limited to little more than a three-hour period in the air. This was a great disappointment, but a situation that could not be helped.

Then the wind played us false. For the whole time we have been in the neighborhood, until last night, we have had but gentle breezes from either east or west, but last night the easterly wind rose to almost a gale. Rolling waves bore down upon us, pounding the Wyatt Earp against the ice. Great waves broke over the ice foot, crumbling away the edges and throwing the wash and fragments far in from the border.

There was not room enough to manoeuvre the vessel easily and hidden rocks might lie anywhere. So we could do no better than lie beside the ice as it pounded and pounded the sturdy sides of the Wyatt Earp.

Then an iceberg came lumbering up and, bearing down, threatened to crush us against the floe. It was necessary to move. We slipped our mooring lines and were almost forced to put out to sea. But right next to the barrier edge, just where it met the barren rock, was a small bight in the ice, formed by melting near an island. Whether it was rock-infested we could not tell, and the waves, kicked most surprisingly

ELLSWORTH PLANS SOUTH POLE CAMP

Says He Will Pass Winter of
1941 There for Continuous
Scientific Observations

SYDNEY, Australia, Feb. 28.—Lincoln Ellsworth, United States explorer, announced today that he planned an expedition into the Antarctic in 1941, during which he would camp the entire Winter at the South Pole with "not more than two companions."

Mr. Ellsworth announced also that he would give the name "American Highland" to the 81,000 square miles south of Princess Elizabeth Land that he claimed for the United States on his recent Antarctic expedition.

In a statement on his projected expedition Mr. Ellsworth said he planned to "carry on continuous observations of importance in several branches of scientific research pertaining to this interesting spot."

in a short distance by the wind, were too high to permit launching the small boat. We moved slowly into the bight, and finally, within thirty yards of the ugly rock, we found a little shelter and moored the vessel.

Wind Finally Dies Down

Beside us was a small section of comparatively smooth ice. It was a little better than the parts we had seen before, but still not good enough to allow a take-off with more than a very nominal load. It seemed to be our only chance, for Lymburner in his flight had seen nothing else within miles which would serve for a take-off field.

Even so, it appeared that we would lose even this, for the swells set up by the waves were heaving the ice into billows. Sections of it were broken off and it was evident that if the wind did not soon abate there would be no field left. We were in high suspense all morning. Then, about noon, the wind died down. Now was our time if ever. So, within a few minutes the big Northrop plane was slung overboard, the smaller tanks filled with gas and the engine warmed up. The plane had not been flown since it left New York last August and it was necessary to make a test flight before venturing out over the vast unknown Antarctic.

The take-off on the test flight proved so bumpy that it was evident we could not make a flight of more than a few hours duration as any further load of gas would probably cause a smash-up of the plane before we left the ice.

By the time the test flight was over the weather, always treacherous in these latitudes, was showing

signs of change. A huge ring about the sun was displayed upon looking at storm clouds to the northwest. We could expect some trouble from that quarter in the very near future.

But toward the south the horizon was still clear. I felt that we should take a chance with the weather since it seemed to be now or never so far as flying from the ice foot this season. Hurriedly the plane was loaded with gas for a little more than a three-hour flight.

Our provisions, enough for the two of us, Pilot J. H. Lyburner and myself, for five weeks, were stowed into the roomy cabin of the Northrop and we were ready.

Pack Ice Ominous

It was 12:55 G. M. T., just after 6 P. M. our time, when we took off and headed south. To seaward and north of us were thousands of icebergs and in the distance an ominous band of pack ice. To the southeast a section of barren hills jutting out from the barrier covered an area of about thirty miles long and some seven or eight miles out from the edge of the continental glacier edge.

This land, most of it in island form, was generally clear of snow and showed in conspicuous contrast to the great glaciated expanse of white that lay to the southward and before us. Great gaping crevasses yawned beneath us for the first fifty miles as we flew inland from the coast. A safe landing on that area with a plane would have been impossible. I doubt that even men on foot could have passed over it.

Our apprehensive thoughts, if we had any, soon gave way to awed wonder at the vast and apparently limitless expanse of ice and snow ahead. The horizon was, for 180 degrees and as far as we could see, straight edged and unmarked by color or contour. Visibility was perfect in all directions except north, where, behind us, the ominous storm clouds were thickening and banking higher.

From this level we quickly climbed to 7,000 feet and into a temperature much lower than it was on the surface. But it was not cold in the cockpit and we were comfortable.

We climbed steadily from 7,000 feet to 11,500 feet and the barrier surface also rose steadily beneath us. The crevassed area near the coast had given place to a furrowed surface. Huge sastrugi with a few patches of smooth snow here and there ranged from east to west.

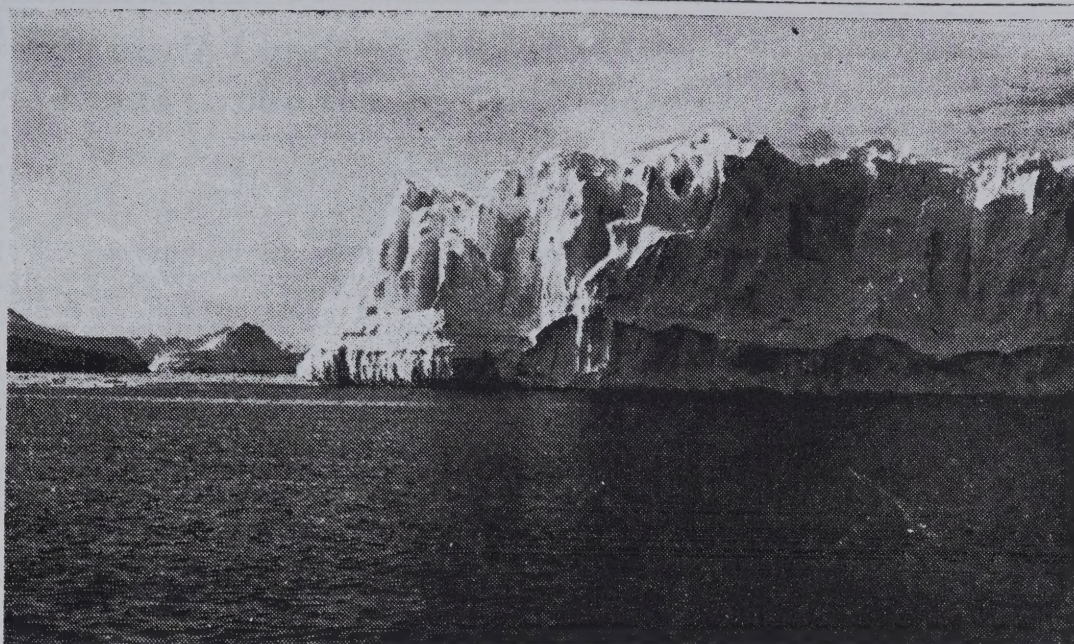
Like Plowed Field

The area looked somewhat like a gigantic white plowed field. Nevertheless, there were small apparently smooth patches here and there and from any point except when over the glacier and crevassed areas I believe we could have made a safe forced landing.

We were having good weather at high altitudes. Ahead of us to the south was an absolutely bright blue sky right to the sharp horizon. Beneath it was a vast unbroken plane of white, its surface rippled with sastrugi and shimmering in the sunlight. There was no sign from our altitude of undulation and we saw no specks of color or serration on the horizon to suggest mountain ranges.

By this time our gas supply was almost half exhausted. If we were to get back safely across those last fifty miles of terrifying crevasses we had to think quickly about a reversal of our course.

I calculated that we had reached latitude 72 south on the longitude of 79; we had flown south for more than 210 miles and could see more than 110 miles further on—total distance of over 320 miles from our



The end of an iceberg which threatened to close in on the Wyatt Earp

AIDE TO ELLSWORTH HURT IN SHIFT OF ICE

First Officer Liavaag Suffers Crushed Knee and Almost Drowns Before Rescue

By LINCOLN ELLSWORTH
Leader Fourth Antarctic Expedition
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MOTOR SHIP WYATT EARP
(Position Approximately Latitude 66 South, Longitude 82 East), Jan. 15.—The Wyatt Earp is once more held up by the heavy pack ice headed north and homeward, and we are in just as much of a hurry to get northward through the pack as we were to get southward through it a month ago. A set of circumstances beyond my control has brought about this need for hurry.

The evening after my successful flight into the interior of Antarctica from latitude 68.30 south, longitude 79 degrees east on Jan. 11, on which I was able to explore and claim about 80,000 square miles of territory for the United States, a

starting point. That is 250 miles further south than any one else has ever seen in this longitude.

Flag Dropped

So, following a custom of explorers, I dropped a brass cylinder containing this record:

"To whom it may concern: Having flown on a direct course from latitude 68:30 south, longitude 79:00 east, to latitude 72 degrees south, longitude 79 east, I drop this record, together with the flag of the United States of America, and claim for my country, so far as this follows, the area south of latitude 70 to a distance of 150 miles east and 150 miles west of my line of flight and to a distance of 150 miles south of latitude 72 south, longitude 79 east, which I claimed to have explored, dated Jan. 11, 1939.—Lincoln Ellsworth."

strong easterly wind was smashing up the bay ice we had used as a flying field, and the drifting down of numerous icebergs caused us to load the long-range Northrop airplane on board and beat a retreat from Ice Bay.

Chief Officer Injured

For two days the wind continued, then as we were beside a small "bergy bit" of ice and with three men on the ice chipping blocks with which to fill our fresh water tanks, one end of the ice broke away and three men were cast into the water. Two of them swam free, but most unfortunately Chief Officer Liavaag, who has been with me and given splendid service since I first ventured out with the Wyatt Earp in 1933, got caught between two sections of the ice and his right knee was rather badly crushed.

Struggling between the bobbing lumps of ice, he went down beneath the water twice, but finally managed to grasp a bit of the floe and come to the surface, from which he was rescued and brought on board.

Each of the men had a most uncomfortable wetting and were severely chilled, but the only injury received was to Liavaag's knee, the cap of which seems to be broken. To set this would require a lengthy operation under deep anesthetic, a condition difficult to control on board the ship, so with the doctor's consent I decided to return as quickly as possible to some port where hospital facilities are available.

After this formal act we turned the machine toward the ship and flew back on a direct course into the clouded northern sky. We came out directly over the Wyatt Earp and after circling a few times we landed.

In the high wind the Wyatt Earp was pounding and pounding against the ice as she had the night before. Great sections of the ice floe were breaking off and drifting out to sea. It was evident that unless the weather cleared soon there would be no ice at that point for use as a flying field.

So we hoisted the Northrop machine back on board and a little later slipped our mooring lines and moved out from the edge of the ice. Now at the beginning of another day we are steaming along the coast looking for shelter from the strong east wind.

We have had clear running from the most southerly point reached by the ship to the northeastward almost paralleling the Great West Barrier until 4 o'clock this afternoon, then we came up against the same type of heavy ice we met and which held us up for several days on the southward journey. So much open water was there between the drifting pack and the solid barrier edge that the strong east wind kicked up one of the nastiest, lumpiest seas we have encountered in the four years of my Antarctic voyaging.

The Wyatt Earp usually rides high above the highest swell and curling waves, but last night the seas swept over her bows and along her rails with considerable force. Then one sea, mounting high above the starboard side, stove in the bridge and carried away the iron stanchions. Fortunately no one was injured and the wind by morning had subsided to give place to a nasty drizzling snow.

The little Aeronca plane is still assembled on deck and as soon as the weather clears we will be out and scouting for a way through the pack ice. Without pack ice interference we should reach port within three weeks, but it is impossible to say how long the ice will delay us.

ON BOARD MOTOR SHIP WYATT EARP, Lat. 63:29 S., Long. 83:56 E., Jan. 22.—A wide belt of heavy pack ice lies behind us and we are now plowing our way through gray fog and heavy seas toward Hobart, Tasmania, in order to obtain hospital attention for Chief Officer Liavaag.

Liavaag's knee, injured a week ago when a section of ice upon which he was working came to pieces and let him into the sea, is progressing favorably and no complications have followed. Still, an operation will be necessary, and I hope to have that carried out at Hobart within the next three weeks.

We have had a terrific battle lasting for five days with the pack ice; the floes were heavy and many of them several miles across unbroken surfaces. The weather has been thick, with snow squalls. Almost foot by foot we have rammed

and jammed and backed and turned our way through more than 150 miles of the pack.

For two days we could see the dark band of "water sky" ahead, which meant that the edge of the heavy ice was not far away, but at times it seemed almost impossible that we should reach it without long delay. But by hauling a piece here and pushing a piece of ice there and squeezing between the floes, until the timbers of the Wyatt Earp creaked and groaned, we have at last managed to come to clear waters and with all sail set we are homeward bound.

My flight this year into the unknown areas beyond the coast of the Antarctic was as pioneering in its nature as was my flight in 1935 from Dundee Island to the Ross Sea. Hitherto it was the custom, by what means justified it is hard to say, to recognize claims in the Antarctic upon what is known as the sector principle.

That is, the discoverer of a coastline while seeing little beyond, has claimed the inland territory in a triangular section following the converging lines of longitude to a distance up to 1,500 miles and to the Pole itself.

Logically one could, by accepting that custom and discovering Cape Horn, claim the whole area of South America. Claims based upon the sector principle have been debated by geographers and some governments for some considerable time. I have claimed the inland area I explored and which no man had seen before for my country, and it is for governments and lawyers concerned with international affairs eventually to consider and rule upon the support and permanency of such a claim.

The surroundings from which I started my flight into Antarctica, i.e., Lat. 68:30 S., Long. 79:00 E., are most interesting from many points of study. Topographically the observations of the area are not restricted at all by snow in Summer, a condition rarely met with in the Antarctic. Geologically it shows signs of being highly mineralized. Geographically it is, with the exception of the South Victoria Land section, which is the western border of the Ross Sea, the most southern area accessible by ship in the whole of the eastern half of the Antarctic Continent.

Ellsworth Lands on Unvisited Isle; Finds Group Off Antarctic Barrier

By LINCOLN ELLSWORTH
Leader Fourth Antarctic Expedition

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ON BOARD MOTOR SHIP WYATT EARP, Lat. 69:10 S., Long. 76:30 E., Jan. 3.—I have just returned to the Wyatt Earp with a most interesting collection of geological specimens taken from an island never landed on before. We reached the Antarctic mainland yesterday at 11 A. M., just as heavy snowsqualls from the south enveloped the land and us, obscuring all visibility.

We cruised slowly in the open water near the coast until 7 P. M., when, in an interval between the squalls, we tried to get ashore, only to be balked by a fringe of heavy pack ice extending a half mile from the land.

Yesterday the weather was too bad for flying, but at 3 o'clock this morning the clouds lifted and the Aeronca seaplane was sent out to reconnoiter. A way clear of ice was soon found, and the Wyatt Earp steamed up to within a short distance of the islands that fringe the coast at Lat. 69:10 S., Long. 76:30 E.

The islands, a group of ten, are two to three miles from the mainland ice, and there is a fringe of bare ground that shows here and there through the overhanging ice cap. Between the island and the mainland was a section of flat ice with a perfect surface for skis, but most unfortunately it is only one-season-old ice and far too much honeycombed by melting to form a safe surface for a take-off with the long-range Northrop airplane on skis.

It might be used in an emergency or in preference to taking off on floats and flying with them over the Antarctic plateau, but before I take the risk of either I am looking for a safer and more substantial ice foot further eastward.

There is another group of islands to be seen in the distance some twenty-five miles east of where I

landed today, and we are now on our way to investigate conditions there. All our flying so far has been done with the Aeronca seaplane, but today we brought the Northrop long-range machine up on deck, and soon it will be assembled except for the fitting of either skis or floats, depending upon the conditions we encounter.

The mainland "continental shelf" ice in this vicinity is quite impossible as a take-off field. It slopes steeply down to an abrupt terminal cliff of a hundred or more feet in height. The surface in any case is absolutely unsuited for the use of skis or even foot travel, for it is so serrated and crevassed as to give the appearance of the leaves of a loosely opened book.

It looks smoother and at a less steep angle eastward, and we shall investigate that condition tonight.

It was a tremendous relief today to set foot on shore after being for sixty-five days on the Wyatt Earp since leaving Cape Town. The land seemed to rock and sway beneath my feet as does the ship.

The geology of the islands is extremely interesting, and much of the rock appears to be pre-Cambrian. I gathered many samples of decomposed sandstone filled with garnets. The general rock was granite and gneiss, of which the crystals of hornblende and quartz are extremely large. Several miles of exposed rock surface was observed at the edge of the continental ice, and these, as well as the islands, were dome-shaped and heavily glaciated.

We are most fortunate in finding such open-water conditions along the coast at this season of the year. We came to the southern edge of the main pack ice about thirty miles from land, and, as we steamed ahead at full speed for the first time in many days, the lap of the waves against the ship seemed to set up a terrific din, especially no-

ticeable after the comparative silence we experienced while in the pack ice.

There is little life along these shores. We have seen two killer whales and a few small rookeries of Adelle penguins on the islands today. No emperor penguins or seals have been seen.

ON BOARD MOTOR SHIP WYATT EARP, Lat. 69:10 S., Long. 76:30 E., Friday, Jan. 6.—Our contemplated flight this morning over the unknown interior of Antarctica was called off because of bad weather.

Yesterday we steamed along the coast to the eastward searching for a better field than the one we discovered Tuesday, but, so far as we could see, this young ice to which we are now moored is the only possible flying field in this vicinity. It is thin and somewhat pot-holed, and in the comparative warmth of mid-day it is extremely treacherous.

Our situation is rather awe-inspiring. We are tied up to the ice field within 200 yards of a huge glacier tongue that has broken off from the mainland and has grounded a couple of miles from shore. It is this glacier that is holding the field of young ice close to the land.

On the flat ice near the ship both emperor and Adelle penguins come in procession to see the ship; they are apparently attracted by the activity of the men on the ice. They stand about and watch us for some time, then either toddle off back to the mainland rookeries or plunge into the sea in search of food.

ON BOARD MOTOR SHIP WYATT EARP, Lat. 69 S., Long. 77 E., Jan. 7.—I am still waiting at the edge of the ice for fine weather in which to make a flight into the unknown section of the Antarctic.

Yesterday morning when we were prepared to transfer the Northrop plane to the ice, clouds rolled up from the northeast, obscuring vision over the barrier and we had to postpone unloading. The Aeronca plane was made ready for a reconnaissance flight and to investigate the weather over the barrier, but no sooner was it ready than the clouds lowered still more and we had to abandon even that attempt.

Although we did no flying yesterday we were not idle, for we had an opportunity to visit some other of the unexplored islands in this vicinity and made some most interesting geological discoveries.

It has been a great relief to those of us on board ship to get some stiff rock climbing, and I expect the result of our efforts will prove most interesting to geologists.

The weather continued unfit for flying throughout yesterday and last night; and early this morning we had to move the ship with all dispatch, for the giant iceberg, which seemed to be aground not far from where we tied up, suddenly started to move and threatened to hem us into the ice.

Hurriedly the men brought on board the cache of gasoline that had been set out in readiness to load up the airplane tanks. Lines were let go and the Wyatt Earp was moved astern quickly between the iceberg and the solid ice edge. We had just room to pass and moved farther out to the center of the ice floe.

Here we found conditions fairly favorable for unloading the plane, and although the ice is strong enough to hold the weight of the plane it is, when the temperature is high, considerably dotted with pot-holes deep enough to wreck the machine.



An island in the Antarctic on which highly mineralized deposits were found. On a flight over the polar area, Mr. Ellsworth discovered 81,000 miles of unexplored territory, which he claimed for the United States.

Ellsworth, in the 'Roaring Forties,' Heads Ship for Kerguelen Isles

By LINCOLN ELLSWORTH

Leader, Fourth Ellsworth Antarctic Expedition

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ABOARD THE MOTOR SHIP WYATT EARP, Nov. 13.—The "Roaring Forties"—we are now at latitude 48:48 south, longitude 67 east—have lived up to their reputation during our rough voyage of fourteen days across the turbulent Indian Ocean from Cape Town. Most of the time I spent braced in my bunk or clinging to anything for support while nursing mashed fingers and a black and blue arm.

We will arrive at Kerguelen Islands tomorrow.

The Kerguelen Archipelago, 124 miles long and 92 miles wide, lying equidistant between Africa and Australia in latitude 49 south, is a monument to igneous forces pent up beneath the great Indian Ocean. It lies just far enough south to fall within the region of icebergs. Consequently, in this wild and stormy neighborhood, navigation is a matter of some anxiety.

From the beginning of the nineteenth century until 1870 a considerable fur and oil industry was based in the archipelago. Sealers and whalers, chiefly American, carried on a hazardous but profitable business hunting fur seals on the beaches and boiling down penguins and sea elephants for their blubber. Meantime scientific expeditions, mostly astronomical, visited these shores to observe transits of the planets across the face of the sun.

Toward the end of the last century the archipelago was regarded with increasing interest by European powers. The French raised their flag at Christmas Harbor in 1893 and took possession.

The introduction by man of rats, rabbits and dogs has been unfortunate for the native birds and seals. The rats were brought by the old sealers and the rabbits by a scientific expedition in an attempt to establish on the island a source of food for shipwrecked mariners, while the wild dogs are descendants of the old sledge dogs used by the Gauss expedition.

ON BOARD M. S. WYATT EARP, Lat. 50 S., Long. 71 E., Nov. 18.—After three stormy days spent in Royal Sound, Kerguelen Islands, we are now heading direct for the Antarctic pack ice. The day after tomorrow we will pass McDonald and Heard Islands and if the weather is fine we will go ashore on Heard Island, the most southerly island in the Southern Indian Ocean.

It was discovered eighty-five years ago by Captain Heard of Boston when he was on a voyage from that city to Melbourne, Australia. Since then few people except some sealers have placed foot upon its shores. It is said to be in the stormiest part of the stormiest ocean in the world.

Hit by Snow and Gales

It will be hard to beat the record we experienced at the Kerguelen Islands, for while we were in the harbor taking on water and cleaning the engines of the ship a succession of snow storms driven by gales of sixty-two miles an hour, with heavier gusts of wind at intervals, swept the island.

Moored with three heavy lines from the bow and three from the

stern and with both anchors down we rode out the storms, and, as well as filling our water tanks, we were able to replenish our supply of fresh meat. Rabbits were plentiful everywhere we went on the islands, and flocks of teal followed us as we tramped over the mossy hillsides.

On one of the beaches visited were numerous sea elephants and several Ross seals, some of which are now suspended in the rigging of the Wyatt Earp. These will serve us for fresh food until we reach the pack ice.

MOTORSHIP WYATT EARP, Nov. 21.—The Wyatt Earp with her decks and rails molded heavily with ice and her rigging encrusted to more than double its normal size with frozen spray is once more and for the fourth expedition under my command forcing her way through the Antarctic pack ice.

Since leaving Kerguelen Island on Nov. 17 we have driven through a series of heavy storms, lashing snow and sleet, weather that made a landing at Heard Island impossible.

We have fought our way south from Heard Island almost in the teeth of a gale such as one pictured when reading of the storms encountered by the early sailors who came to these latitudes in ships of sail only.

For the last two days, driven by wind of more than fifty miles an hour, the high twisty waves had their tops whipped into spray which, raking the ship from stem to stern, rattled like heavy hail as it dropped almost solid and then froze to the sails and rigging. The ship pitched and rolled violently.

Our forward speed at times was reduced to less than a mile an hour, but the only thing we could do was to face the seas and hope for better weather. We had little hope of respite for some days more, for the ice charts show that usually not even icebergs are likely to be met before reaching latitudes 225 miles south of where we encountered the pack at midnight [1:30 P. M. E. S. T., Nov. 20] last night.

Our position was then approximately latitude 55 South, longitude 75 East.

Our meeting of the pack ice was dramatic. The high wind had subsided suddenly and the storm clouds cleared from the sky. The bright and colorful Aurora Australis shot back and forth across a clear but night-darkened sky, and for a while the horizon was clearly defined.

Then suddenly we entered a curtain of ice crystals hanging in the sky. We could see the level top of the crystalline haze which seemed to be only six or seven hundred feet above the sea. Once through its edge, visibility was nil. The high swell of waves was still to be felt, but the sudden stillness of the air was awesome.

Before long the familiar crunching of ice against the ship's bows and the bumping shocks transmitted through the vessel told us that we had entered the region of king frost.

ABOARD THE WYATT EARP, Dec. 7.—This morning, with the decks snow-laden after last night's blizzard, the Wyatt Earp lies idle

and wind pressed beside a mile-wide field of flat ice, one of many such fields scattered in the vast area of Antarctic pack ice which surrounds the polar continent.

So closely packed is the ice in this vicinity that we have been unable to move the engines for the last two days, but, drifting with the ice, we are carried nearer and nearer to the Antarctic shores. Today our position is Lat. 65:09 South and Long. 78:06 East.

Six hundred miles of travel through the ice lies behind us, leaving 200 miles in all to cover before we can hope to unload our long-range airplane on to the barrier and seek the hidden secrets of the heart of the Antarctic.

In the first seven days we pushed our way through about 570 miles of ice-strewn seas. The floes were generally heavy, but scattered, and with a few tightly wedged barriers here and there. But in the last ten days we have made scarcely seventy miles southing. The ice is less broken, though strangely enough it is not so heavy as it was farther north.

Journey a Tedious One

Through the thinner ice we could make only a writhing track by butting and rebutting at solid cakes and grinding our way through the softer and thinner patches. It has been a tedious journey relieved by few incidents except when from two isolated patches of open water I dispatched Pilot J. H. Lymburner in the little Aeronca seaplane to scout for the easiest passage through the ice, and when occasionally a whale, a seal or a penguin pops up here and there and casts an inquiring eye at the sturdy Wyatt Earp as she squirms and wiggles almost helpless in the grip of the ice.

We envy the native life, its facility of movement as it slithers gracefully its way through the small patches of open water and dives almost effortlessly and unrestricted to reappear on the farther side of a heavy floe. However, native life, one species of Antarctic Petrel excepted, is scarce in this area. We have seen fewer than a dozen penguins, six of them golden-breasted emperors majestically at home on the ice or in the water and the others the black-breasted, white-eyed adelies.

The whales seen are of the species known as Minke, the seals either Weddell or Ross and one sea leopard wriggled and snarled as we disturbed its slumber when we bumped onto a hummocky floe. Yesterday a slim "ice fish" was seen swimming near the surface and above a projecting ice foot. This is a rare sight in these waters, one I, myself, have not seen in the four years of my Antarctic experience.

Fish have been netted in lower depths of the Antarctic waters, all about the shores of Antarctic islands but they seldom are seen swimming freely near the surface. Although the tardiness of progress is trying, the changing of the pack ice scenes are fascinating.

Fog Rose Rapidly

Yesterday, with a sudden drop in the temperature and during the calm before the high wind of last night sprang up, a weird fog rose rapidly from the surface of the ice and hung blanket-like with a fifty-foot thickness above the pack, obscuring all the surface.

Above the fog the tops of icebergs stood out in the dim sunlight like gilded islands. Today as we lie idle in the murky haze, huge flat-topped icebergs, some of them three or more miles in diameter and rising

300 feet out of the sea, drift phantomlike past us. Some have jagged and minareted tops, for often the flat-topped masses turn turtle when they become old and expose their ragged bottoms.

Often in the last few days we have forged ahead for a few miles, only to drift back again with the wind and current. It is weird and discouraging to pass a recognizable berg during one day's travel, then to be held up by the ice and drift (for the pack ice drifts faster than the bergs) back again behind it. I have several times lately awakened to find that we are in the vicinity of a berg we passed the day before.

The ice mass this year seems to have broken from the continent in midwinter and drifted far from shore, allowing a belt of smooth ice to form between last year's pack and the barrier. It is this few-months-old, tough, new ice that is holding us up at present.

AUSTRALIANS DISPUTE ELLSWORTH'S CLAIMS

Plan Further Exploration in Antarctic With His Ship

SYDNEY, Australia, Feb. 8 (P.)—Commonwealth officials today sent a report to the Australian Cabinet disputing the right of Lincoln Ellsworth to annex 80,000 square miles of new territory in Antarctica in behalf of the United States.

Mr. Ellsworth announced his claims to this territory in a dispatch from the South Pole. Later, when his expedition arrived at Hobart, Tasmania, on Feb. 4, he announced he was claiming a total of 430,000 square miles for the United States.

Today's report was the result of an investigation into Mr. Ellsworth's original claim for 80,000 miles of territory. The report said Australia definitely claimed the region in question when it was explored in 1928 by Sir Douglas Mawson.

It was said, however, that Australia would not take steps to contest the territory unless the United States took the initiative by supporting Mr. Ellsworth's claims.

Australia now is planning further exploratory work in the Antarctic, following the purchase of Mr. Ellsworth's ship, the Wyatt Earp, and two airplanes, which was announced yesterday.

MELBOURNE, Australia, Feb. 13.—Lincoln Ellsworth, Antarctic explorer, in a statement made today at Hobart, Tasmania, said he welcomed a dispute over his claim to Antarctic territory on behalf of the United States as it might be a stimulus to interest in and settlement of the polar lands.

Sir Douglas Mawson, Australian explorer, based his claims on the sector principle adopted by geographical societies, said Mr. Ellsworth, but the basis of claims recognized by governments was the land seen by the eye or within range of the eye. Mr. Ellsworth added that he had not thought it necessary to make a report to Washington but thought the information would reach there.

Following a Cabinet meeting in Melbourne today Prime Minister Joseph A. Lyons said that the Ellsworth ship Wyatt Earp would be used by Australia, which has purchased the vessel, to fly the Australian flag over Antarctic territory claimed by the Commonwealth.

EXPLORERS FIGHT FIRE ON THEIR SHIP

Blaze on Plane Amid 5,000
Gallons of Gasoline on Wyatt
Earp Soon Extinguished

By LINCOLN ELLSWORTH
Leader, Fourth Ellsworth Antarctic
Expedition

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ABOARD THE WYATT EARP,
Dec. 13.—This morning at 1 A. M. we broke clear from the tightly pressed heavy belt of pack ice that had held us fast for the last seven days.

Now, at 4 P. M. at Lat. 66 S., Long. 77 E., after threading our way through a mass of grotesquely formed old overturned icebergs and loosely strewn heavy floes, we are seventy miles south of yesterday's position and within 150 miles of the nearest known edge of the solid Antarctic barrier. Before us to the south the pack is closing, and I doubt that we will proceed much further without another hold-up while the wind and currents open up the ice.

During the past week the pack about us, though heavy and tightly pressed, has been melting fast. Thick hummocky floes, ranging from five to fifteen feet in thickness, are thinned down noticeably by partly melting under water and by evaporation and melting on the surface.

We were not the only ones troubled by the ice, for many whales at intervals came up nose first in the little pool of water at the stern of the Wyatt Earp and puffed and sucked in breath noisily several times before diving down again to seek another small opening in whatever direction they cared to take.

Floes Fit Close Together

Mushy ice filled most of the small spaces between the heavier floes and their crumbling edges permitted the force of the wind to fit them close together. These crumbling edges on several occasions were our salvation for, by drifting slightly faster than the pack, which in turn drifted faster than the bergs, we were borne down against the icebergs and had to fight our way with engines at full speed foot by foot to one side or the other of the towering masses of ice.

During one of these forced movements we suffered an accident that might have led to grave disaster. A hot spark from the engine room funnel fell upon the fabric wing of the little Aeronca seaplane and in a few seconds a roar of flame spread over the wing top. Fortunately the fire was noticed immediately by Captain Johansen and Second Officer Norseth.

Pilot Lymburner, who was on the forward deck at the time, rushed for the fire extinguishers and soon had the flames under control. Before the fire was extinguished a large hole was burned in the wing covering. However the machine is not beyond repair and the men expect to have it in flying condition within the next few days.

But for the alertness of the men the fire would have soon taken full



The Wyatt Earp, base ship of the expedition, stuck in heavy pack ice in the polar regions.

control. With 5,000 gallons of gasoline on the wooden decks of the Wyatt Earp, our condition would have been precarious.

Bad Season for Ice

It is too early to judge the condition of the ice at the edge of the continent but, taking into consideration the fact that we met the pack ice in Latitude 55, about 660 nautical miles north of where we are today, and not having seen an extensive area of open water since first meeting the pack, we can safely say that it is an extraordinarily bad season for ice in this section of the South.

This does not necessarily mean that the mean temperature this season is much lower than normal. In fact, it seems from the accumulated evidence of several years that the Antarctic conditions are getting warmer.

The condition of the ice we have passed indicates that early last Winter it broke clear from the edge of the continent, drifted north and hummocked badly. The intervening spaces then filled with new ice and so extended the belt of pack ice 200 miles or so north of its usual limit.

If such conditions exist around the whole of the Antarctic Circle it means that the extent of the pack ice surface is almost double its normal area.

ON BOARD MOTOR SHIP WYATT EARP, Lat. 68:24 S., Long. 73:42 E., Jan. 2.—From the upper deck of the Wyatt Earp the solid ice barrier of the Antarctic Continent can now be seen. We sighted it at 3 A. M. on New Year's Day, just before being held up by pack ice that is too closely wedged to permit further progress southward.

A reconnaissance flight in the Aeronca seaplane showed that to the south the rough pack ice was practically solid up to the barrier, and we are now bearing eastward, seeking a lane of lighter pack, through which we might push and reach the barrier's edge.

For fifteen days before yesterday we lay with engines idle, drifting with the winds in heavy impenetrable ice to the east and to the west, but gradually being drawn southward with the current. Then, as the ice slackened somewhat, we

pushed forward and came within sight of the fields, from which I hope to fly out into the unknown interior of the continent.

A Chapter of Accidents

Although the ship's engines have been idle for many days the period was not without incident. We had, one might almost say, a chapter of accidents. The first was several days ago.

Harold Ronneberg, the youngest sailor on board, when giving a voluntary gymnastic display fell from a horizontal bar upon the deck and cut his scalp severely. He bled quite a lot, and Dr. Harmon F. Rhoads Jr. was required to put fifteen stitches in the wound. Ronneberg, however, has suffered no permanent ill effects, and now, with bandages removed, he is keeping his regular watch hours.

Then we discovered that the hard, steel-like ice through which we have been forcing our way for nearly 800 miles had ripped two of the outer hardwood planks from the bow of the Wyatt Earp and had carved out a section several feet long and an inch and a half deep from the main timbers of the vessel.

It looked like a nasty gash on the side of the sturdy Wyatt Earp, but the Norwegian crew on board were equal to the emergency. With a sling about a heavy mass of ice and a block and tackle to the masthead, the ship was careened, and by shifting oil and supplies from one side of the ship to the other we brought the damaged part above the water line and undertook repairs.

Standing on a convenient ice floe the carpenter chiseled out the damaged parts and fitted in new planks and now the ship is as sound as she was when we entered the ice.

Another minor accident, which called for ingenuity and skill, was the failure of a lifeboat davit, to which hung the starboard lifeboat full of water. It suddenly gave way, and the lifeboat, held only at one end, fell bow foremost into the sea, spilling its contents noisily. A sailor attending to matters in the boat had left it just a moment before it fell and so narrowly escaped a ducking.

With a blow torch and chain blocks the davit was righted and all the damage has been repaired.

We spent a Merry Christmas Eve,

with the ship that day decorated by a sleety blizzard that encrusted every rope and spar with an inch thickness of clear ice and which gave the effect of looking at a monstrous X-ray photograph of a specter vessel.

Crew Take Sun Bath

New Year's Day was clear and exceptionally warm in the sun, so much so that several of the crew have stripped and lay sun bathing on the hatch. Nevertheless, the temperature in the shade is just above the freezing point.

We are pushing our way slowly through heavy pack, which floats in brownish water. The pack is getting riddled by thaw and as we pass some of the lumps come to pieces and flatten out on the surface of the water.

Animal and bird life is comparatively scarce as occasional crab-eater seal is seen basking on the ice. Now and then a young Adeline penguin pops like a jack-in-the-box out of the water on to a floe, and squawking in amazement runs after us as fast as his stubby legs can toddle, or, if in greater haste, he tumbles to his tummy and, using both flippers and feet, toboggans along the surface.

In the water a few shrimps are occasionally seen gamboling with dwarfish leaps, but this section of the Antarctic waters this year is comparatively destitute of these shrimps, or krill, as the whalers call them, and which are the food of both whales and penguins.

Here and there in the water a ropy-looking sea vegetable drifts by. Sometimes several lengths are seen festooned to the lower parts of a scraggy lump of ice.

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members to receive THE POLAR TIMES
twice a year.

VAST ANTARCTIC AREA CLAIMED BY GERMANY

Expedition Returns From Mapping Region on Long Flights

BERLIN, March 10.—Radioed reports from the motorship Schwabenland, homeward bound, say that the "German Antarctic Expedition of 1938-39" has discovered and mapped some 135,000 square miles of land.

Wide plains, peaks 10,000 feet high and a central polar range of 13,000-foot altitude were "stereophotographically" measured with the newest German instruments from the expedition's planes. Terrestrial-magnetic, meteorological and oceanographic observations and soundings were made on the entire trip. Radio probing ascents were made to an altitude of 92,000 feet.

The official German News Bureau contends that on Jan. 14 Norway claimed a large portion of the Antarctic for herself, including that "discovered" by the German expedition.

The expedition used two flying boats. It was under the leadership of Captain Ritscher. The territory surveyed was around the Zero meridian on the Antarctic continent, part of which is claimed by Norway.

Germany has "reserved all rights" to the territory. During flights swastika flags were dropped every twenty miles along the border of the regions and flags were hoisted at several points.

The planes made fourteen flights, covering 6,200 miles. About 230,000 square miles of territory was photographed and maps were made from the photographs.

The southernmost point reached by the expedition was 72 degrees 23 minutes south of Zero meridian. The westernmost point was 71 degrees 10 minutes south, 4 degrees 50 minutes west while the easternmost was 72 degrees 10 minutes South 16 degrees 30 minutes East. At each of these points the expedition dropped swastika flags as markers.

Oceanographic researches were conducted along the Zero meridian on the return trip. The expedition also gathered meteorological and geological data.

Five king penguins and three Adelie penguins were brought back by biologists accompanying the expedition. It was said biological discoveries would be valuable for Antarctic whalers.

HAMBURG, Germany, Dec. 22.—A group of scientists led by Captain Ritscher left here today aboard the motorship Schwabenland for an Antarctic expedition, it was announced today. The expedition, known as the "German Antarctic Expedition of 1938-39," is sponsored by the German exploration community and has at its disposal two planes.

Lufthansa, the German civilian air service, used the Schwabenland for catapulting mailplanes during the series of North Atlantic trial flights last Fall.

OSLO, Norway, March 10.—The dispute between Norway and Germany over the possession of barren Antarctic icefields has started with the return of the German Antarctic expedition under Captain Ritscher aboard the Schwabenland. The 350,000 square kilometers Captain

Ritscher claims to have discovered and charted are said to be within the territory put under Norwegian sovereignty by the government resolution of Jan. 14, 1939.

Foreign Minister Halvdan Koht declared today that the disputed territory was properly explored, mapped and photographed by land, sea and air by the Norwegian whaler Lars Christensen's expeditions in 1929 and 1937.

Japan Urged to Claim Territory

TOKYO, Feb. 28.—Japan has the right to certain snow-covered territory in the Antarctic, according to the Nobeoka farmers' conference which met in the city of Miyazaki yesterday and telegraphed to Representative Doki to direct the matter to the notice of the government.

Discovery of the territory is credited to Lieutenant Nobe Shirase, who in 1912 touched the area in a 200-ton vessel. Lieutenant Shirase is now almost 80 years old.

For some years Kojiro Hiyoshi, chairman of the Nobeoka Agriculture Association, has propagandized for annexation of this territory. In support of the Japanese claim it is said Rear Admiral Richard E. Byrd in 1935 recognized Japanese priority.

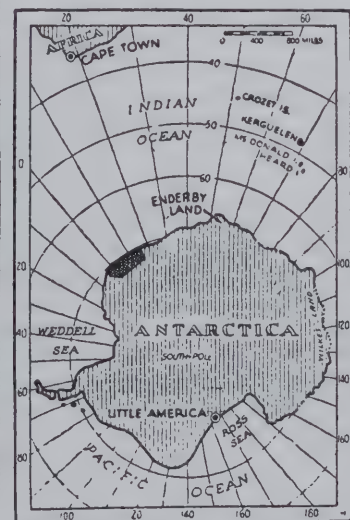
"Let the Rising Sun be unfurled over the South Pole!" cried Mr. Hiyoshi in a speech that persuaded the farmers' convention to send its telegram to Representative Doki.

Two Expeditions Led by Shirase

The first of two Japanese expeditions into the Antarctic commanded by Lieutenant Shirase failed because of a combination of bad weather and lack of experience and provisions. The second, considered a complete success, resulted in the naming of two bays in the vicinity of the Bay of Whales and the marking of two land points for Japan.

Accounts of both expeditions are given in The Polar Times, published by the American Polar Society.

The ship used on both ventures, the Kainan Maru, left on the second one from Sydney on Nov. 19, 1911, with provisions for two years. The Admiralty Range in Victoria



REICH STAKES OUT LAND

The cross-shading indicates the territory claimed by Germany in Antarctica as the outcome of the Schwabenland expedition.

Norway Claims Vast Area In Antarctic for Whaling

OSLO, Norway, Jan. 14.—An official State Council bulletin today proclaimed the Norwegian occupation of that part of the Antarctic continent that extends from 17 degrees, West, to 45 degrees, East, including the coast, the land within it and the adjacent seas.

The territory is about 1,000,000 square miles, ten times the size of Norway, and represents about one-fifth of the Antarctic coast line. It has been explored many times by Norwegians, backed chiefly by the whaling industrialist, Lars Christensen.

The government makes it clear that the move is designed to protect the whaling industry, but that rights of other nations in the waters will be respected. There is no conflict with the territory recently claimed by Lincoln Ellsworth for the United States.

Land was sighted Jan. 3, 1912, and two weeks later the Barrier Edge was reached. The point where the ship docked was named Kainin Bay. Near this bay the Japanese met Captain Roald Amundsen's ship, the Fram, and boarded her.

A landing party headed by Lieutenant Shirase traveled across the Ross Ice Shelf at the rate of fifteen to twenty miles a day until it was stopped by an impassable crevasse 160 miles from the starting point. Unable to go on, the party deposited a copper case containing the names of the expedition members. They returned to the ship Feb. 4.

Meanwhile another party from the ship had traveled into King Edward VII Land, where it erected a "memorial board" in honor of the expedition.

POLAR AIR ROUTE PLANNED

British Hope to Reduce Time From Cape Town to Sydney

LONDON, Dec. 22 (AP).—A southern Polar route that would cut about 10,000 miles from the air journey between South Africa and Australia is suggested in a government white paper, an official report.

To fly from Cape Town to Sydney now, one must travel the length of Africa northward to Alexandria, then follow the Empire Route via India and Singapore.

The government proposes to ask French permission to use little-known Adelie Land, 1,400 miles from the South Pole, for a stopoff on the new route. Planes from Africa would follow the southern Polar circle route to Adelie Land, then swing northeast to Australia, saving about a week in flying time.

The trip via India requires around twelve days.

In return for France's permission for the British Empire to use Adelie Land, 1,400 miles from the South Pole, the governments of Britain, Australia and New Zealand have agreed that French planes shall be free to use their South Polar territories.

Scientist Weighs Whales Without Catching Them

Official at Smithsonian Works Out a Formula

WASHINGTON, Jan. 30.—A mathematical formula for weighing whales at a distance and without using scales has been worked out by Dr. Leonard P. Schultz, curator of fishes of the Smithsonian Institution. By this means it will be possible to determine the approximate weight of a whale, or of a large fish such as some of the giant members of the shark family, by getting within sighting distance of the creature in the water—much as an astronomer can determine the comparative weight of a distant star by observations from the earth.

There is a constant relationship, Dr. Schultz finds, between a whale's weight and the length of its body. This has been found to hold approximately true for all these giant sea mammals or for "streamlined" large fish on whom both weight and length measurements have been taken. The weight, he finds, equals a constant multiplied by the length raised to a certain power—the power and constant varying somewhat for each species.

For one thing, Dr. Schultz has provided a means of checking up on some big fish stories, for their narrators henceforth will have to do some quick thinking to get the weights they attribute to their catches to match the lengths they describe. Otherwise the formula is expected to prove of considerable advantage in scientific investigations. The length of a whale or shark could be estimated fairly accurately from a naked eye or field glass observation coupled with a little arithmetic, and then the approximate weight could be calculated. In this way it may be possible to obtain valuable data on the growth rates of these animals.

Antarctic Currents Traced

According to Nature, the British weekly journal of research, Cambridge University Press has published Vol. 15 of Discovery Reports, resulting from the 1932-33 circumpolar cruise of the Discovery II in Antarctic waters. The book has to do with the water currents flowing in the southern ocean primarily; with the marine mollusks of New Zealand waters, where six new genera, 128 new species and 13 genera previously unknown there, were reported; and lastly with the plight of the blue whales which seem to be on the road to extinction, due to unregulated whaling activities.

In writing on the hydrology of the Antarctic Ocean, G. E. R. Deacon says that oceanographers can no longer suppose that the ubiquitous cold bottom water originating in the south, but reaching as far as 40 degrees North, is formed by the sinking of shelf water all around the Antarctic Continent. He feels that it arises in, and only in, the southwestern and western parts of the Weddell Sea, that it flows eastward, incorporating water from the warm deep layer now known to exist throughout the whole Antarctic Zone, and as a highly saline (salty) body, flows northwards in the Atlantic, Indian and Pacific Oceans. It is the heaviest water in the sea.

Herbert B. Nichols
Natural Science Writer of
The Christian Science Monitor

Charting the Antarctic

BY LARS CHRISTENSEN

IT IS OF COURSE POSSIBLE for an owner of whaling ships to carry on his business competently without ever having seen the whaling grounds, but personally I like to familiarize myself on the spot with the work which has engaged my interest, my energies, and my imagination for more than thirty years. Since 1930 my wife and I have made four voyages to the Antarctic, all of which were undertaken for business reasons combined with scientific and geographical purposes. Perhaps a spice of inherited love of adventure also entered in among my motives. In addition I have during the past ten years fitted out five other expeditions undertaken with the exclusive aim of solving certain scientific and geographical problems.

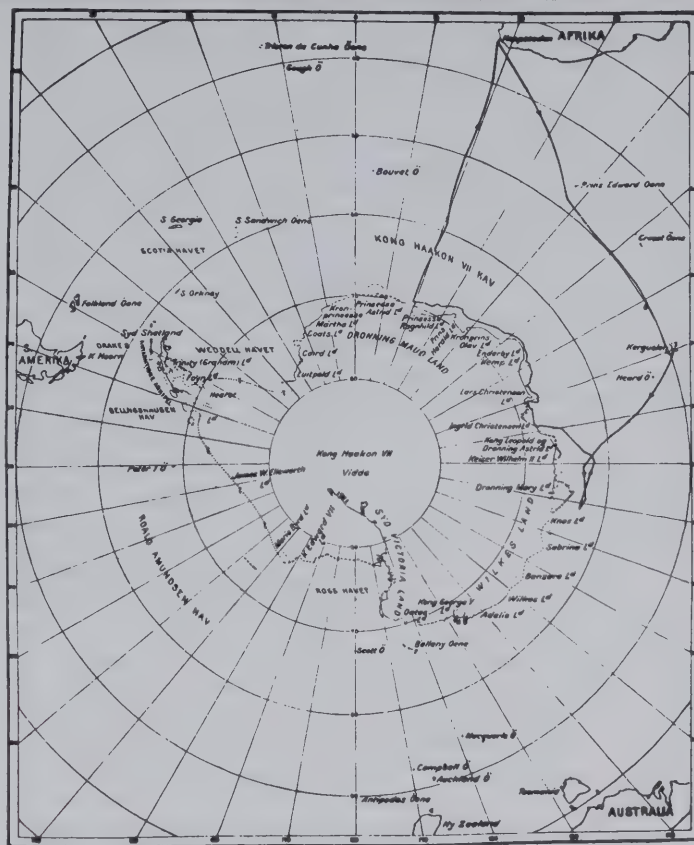
It was a Briton, Captain Biscoe, who first sighted the Antarctic mainland, February 28, 1831, but it was a Norwegian, Henrik Johan Bull, who was the first man to step ashore on that mighty land which has been rightly called the Seventh Continent. On February 24, 1894, he effected a landing at Cape Adare at the eastern entrance to Ross Sea. It was also vouchsafed to Norwegians to be the first to plant their flag on the geographical South Pole. It is not my intention to give an account of the history of Antarctic discovery, and I only mention these facts in order to give perspective to my narrative. I would like also to add a few words about the contribution of my native town, Sandefjord, to Antarctic research.

In 1892 my father sent Captain C. A. Larsen commanding the sealing vessel *Jason* from Sandefjord to hunt whales at what we now call the Western Antarctic Island Group. In the following year he again sent Captain Larsen south in the *Jason* together with two other sealing vessels, the *Hertha* commanded by Captain Evensen and the *Castor* commanded by Captain Morten Pedersen. These two voyages were not successful from the commercial point of view, but they laid the foundation of geographical pioneer work in the seas where whales and seals were hunted. In the autumn of 1905 my father sent a whaling expedition with a floating factory to the Western Antarctic Island Group. Very few people believed that he would make much by it, but success and good fortune followed our flag on that occasion, and whaling in the Antarctic has for a third of a century been a great source of revenue for Norway.

From 1905 to 1925 all the whaling in the Antarctic was carried on by concession, dependent upon England, and the whaling area was restricted to the West Antarctic Island Group (and the inner Ross Sea). But from 1925 to the present day the whaling concession has been superseded by the tremendous development of pelagic whaling, and the grounds have been extended until they now stretch from 80° W. to 180° E. south of 50° S. It was in connection with this great change in the whaling industry that I sent out the expeditions of the *Odd* and the *Norvegia* and that I also myself went on four voyages to the Antarctic. It is the most recent of these that I shall tell about here. The object was, with the help of aerial photography and electrical sounding, to improve our maps of the territory which had been discovered in the South Polar Continent during my earlier voyages.

The Antarctic is a vast region. Its problems are many and far-reaching. I have intended my expeditions to be a Norwegian contribution to the work of discovery and research which has been so intensively carried on in this twentieth century by many countries, and not least by my own.

I am not competent to give an opinion on the oceanographical, geological, botanical, and meteorological labors which have been achieved by my nation, so I will confine myself strictly to the geographical side of the question; and if you will look on the map,



The Antarctic in 1937 Showing the Route of the Expedition

I will describe to you the unknown territory that has been discovered by Norwegians in the Antarctic during the last ten years. With the exception of Enderby Land and Kemp Land, the whole of the coast between 85° E. to about 20° W. has been discovered by Norwegian explorers or sailors since the autumn of 1929. Starting from the west, you will see Queen Maud Land, Crown Princess Märtha Land, Princess Ragnhild Land, Prince Harald Land, and Crown Prince Olav Land. East of Kemp Land you will see Lars Christensen Land, Ingrid Christensen Land, and King Leopold and Queen Astrid Land.

Since Amundsen's brilliant achievement in the winter of 1911-12 the central South Polar plateau has borne a Norwegian name—King Haakon VII's *Vidde*. But apart from the Norwegian names resulting from the *Jason* discoveries, we found British, German, French, American, and Russian names in the earlier maps of the Antarctic regions. In the course of eight years we have succeeded in spreading Norwegian names over about a quarter of the coasts of the South Polar Cap.

This result so far exceeded my expectations that I might have rested on my oars, satisfied with what had already been accomplished. But there was still something lacking. The newly discovered regions were not satisfactorily charted, and so long as that remained incomplete, I did not feel that I had fulfilled the task I had undertaken. In December 1936 I therefore sailed south again to chart the territory discovered by my men in East Antarctica. This was a most attractive undertaking from every point of view; for it was possible to utilize modern methods and resources in improving the maps of territories far distant from Norway, and yet intimately connected with it, since in the past almost all that had been done there had been done by Norwegians, and, if their luck holds, they will be working there in the future.

Besides my wife and myself, our youngest daughter and two guests, our expedition included Viggo Widerøe, the aviator; Nils Romnæs, a radiographer and aerial photographer; two mechanics, Strandrud and Fidjeland, and a photographic expert, Erik Simensen. We also had

with us Captains Klarius Mikkelsen and Nils Larsen, the first of whom discovered, *inter alia*, Ingrid Christensen Land, and commanded the *Thorshavn* upon three of my four voyages to the Antarctic. The other had been on all the *Norvegia* expeditions: the first year as mate, and afterwards as captain.

We decided to use a Stinson flying-machine, 1936 model, with a 350 h.p. engine and a radius of action of 1,200 km. The Norwegian government's Svalbard and Arctic Ocean Office lent us the same charting camera that had been used at Svalbard in the summer of 1936, as well as one that had been constructed for taking photographs from the air.

In previous years explorers have had to content themselves with coast maps drawn up from the bearings taken by aviators, in addition to sketches of the outlines of a number of mountains and peaks. Now, our intention was to attempt to make a *bona fide* map both of the actual coast-line, and of the actual country adjacent to it. The aviators were to carry out their work as accurately as circumstances permitted, ascertaining the position of the outstanding headlands on the coast, marking down mountains and other prominent points that might appear in the landscape. Photographs were to be taken at an angle of 20 degrees so as to include both the horizon and the coast-line in the picture. Given favorable conditions, it was calculated that we ought to be able to map land lying as far as 50 to 60 kilometers distant from the aeroplane route.

The mechanics and the photographer with the plane and the scientific apparatus travelled in my tanker *Thorshavn* from Sandefjord to Cape Town, where the other members of the expedition were to join them on December 28. My wife and daughter, Mr. and Mrs. Widerøe, Mrs. Racklew, and I went by train to Athens via Berlin, and thence by air-liner to Cape Town, where we spent Christmas.

On December 28 we all left in the *Thorshavn*, heading south for the whaling-grounds where, according to our usual practice, we had first to carry supplies of fuelling oil to the whaleboats, and receive whale-oil from them in return. After that there were soundings to be taken and charting to be done. The first floating factory to be visited was the *Ole Wegger*, owned by my firm.

I am no poet, so I will not attempt to describe the emotions that thrill one when two great ships glide alongside of one another to engage in a mutual task in the Antarctic ice world. Anything I could say would be commonplace.

According to custom, I received from the manager a typewritten report of the fishing in all its details. This covered a very wide ground. Besides the total number of whales killed, there was also a calculation of the number of feet all the whales together would measure if they were arranged head to tail in a straight line. For instance, the total

catch of the whaleboat *Tordönn* was 112 blue whales; number of feet, 9,250.

The first time I received a report of this kind I said to the manager: "Just what is your idea in making this kind of report?" "Well," he replied, "it stimulates competition among the gunners. After all, numbers mean a good deal. And there's another thing. When I go home to Norway, I like to do a bit of walking, and I measure up the road according to the number of feet of whales caught during the whole season. So I go out every day, feeling very proud that such a length of whales has been shot by my boats in the past season!"

While the *Thorshavn* and the *Ole Wegger* were exchanging oils, the *Ole Wegger's* reserve boat, the whaler *Firern*, got ready to receive on board Widerøe's plane, Widerøe himself, Romnæs, and one mechanic, in order to carry them to the edge of the ice. The whaleboat had been fitted out in Norway with a crane astern, so that it might easily launch the plane on the water, and take it on board again. This arrangement proved very useful.

We all know the old saying "Man proposes, but God disposes." We got an example of this when the plane was being shifted, for it became entangled in the *Firern's* gear and got its elevator buckled and its rudder bent. We all looked a bit serious, but fortunately things were soon put right, thanks to the *Ole Wegger's* welding-shop. I could not help thinking what a very slight accident might possibly overthrow all our plans.

Our plan for the first twenty-four hours was as follows: the tanker *Thorshavn* was to continue on an easterly course to load oil from the floating factory *Sir James Clark Ross*, after which it would return to the factory *Ole Wegger*. In the meantime, the whaler *Firern* would go southwards, taking the plane and the aviators, as far as the Shackleton Barrier whence it would proceed northwest, steadily charting and taking photographs. When we had finished unloading and shipping oil, the *Thorshavn* would join the *Firern* as dépot-ship. As we could only have the use of the *Firern* until February 1, we should have to continue our explorations in the *Thorshavn* after that date.

The *Thorshavn* met the *Sir James Clark Ross* on January 17, at about 62° S., 103° E. In addition to fuelling oil, we carried 38 bags of mail. The whalers are lucky when they get a good lot of whales and a good lot of letters. The letters need not be very long, but they must be cheery and happy. No need to send on bad news to sailors while they are out on the whaling-grounds. If it can be postponed, let it wait till after their return home. On the whaling-grounds there is not so much to distract their minds as there is at home, and that makes sad thoughts doubly hard to bear. Let me give you an instance of what letters mean to those who sail on the broad seas far from their own homes. Our mess steward on board the *Thorshavn* got a telegram from home with good wishes for his nineteenth birthday. I saw him pull it out of his pocket and read it five times in the course of an hour!

On January 21-22, we were back on the factory *Ole Wegger*. The gunner Krog Andersen informed me that he had had a whale in tow with only two lines out. We rowed over the position he had given us with the echo-sounding apparatus, and touched bottom at 310 meters. The new bank was named Gribbank, after Krog Andersen's whaler *Gribb*.

I mentioned that the plane, with the aviators and Klarius Mikkelsen had been transferred to the whaler *Firern* on January 15. On the 24th I received Widerøe's first report. They had had unsettled weather all the time, with wind, and snow-mist or fog. Instead, therefore, of beginning their investigations outside the Shackleton Barrier the *Firern* had gone further west. After travelling for three days and nights, they found themselves off Ingrid Christensen Land, and thence, veering slightly north and east, they were now lying off King Leopold and Queen Astrid Land, which was discovered in January 1935 by Lieutenant Gunnestad and Nils Larsen, during the third expedition of the *Thorshavn*. From this spot, Widerøe and Romnæs made a flight, and they succeeded in charting the whole of the West Barrier. As it joins directly on to the inland barrier, they saw no land. They measured



The Klarius Mikkelsen Mountain on Lars Christensen Land, Where the Expedition Landed and Left a Cache



The Most Easterly Bare Coast on Ingrid Christensen Land with the West Barrier Faintly Visible in the Horizon

the barrier where it entered the sea, and found it to be 75 meters high. It was also evident that the barrier did not reach down to the bottom everywhere, but lay and drifted, so that the map had to be drawn up afresh.

The *Thorshavn* had now quite finished with the *Ole Wegger*, and we prepared to join the *Firern*. On January 25, while sounding from the *Thorshavn* we came upon an unknown bank in the middle of Olaf Prydtz Bay. While the Bay varied in depth in other parts from 800 to 900 meters, the depth over the bank was only 150 meters. We named it "The Four Ladies' Bank" as a compliment to our feminine travelling companions. On the afternoon of the same day, January 25, we reached the *Firern* which was lying in a big ice harbor outside Ingrid Christensen Land. This land was discovered by Klarius Mikkelsen in 1935.

On January 27 we had glorious weather, ice all round us, but with sunshine and a dead calm. The plane made three trips. First, to carry out some charting at a height of 2,000 meters, over a stretch of coast about 430 kilometers from the West Barrier on the East, to Sandefjord Bay in the West. Then Widerøe took up my wife as passenger for a flight over Ingrid Christensen Land, where she let fall a flag. On the third trip Mrs. Racklew and I went as passengers.

It gives one a quite unique sensation to look out over unknown land, or land which has only been seen by ten or twelve other people; but all other feelings were speedily merged in admiration for the wild grandeur of the landscape. The view over the Westfold mountains was particularly beautiful and impressive.

As the weather was fine and sunny we thought we might make an attempt to land. We went on board a motor boat, which we had brought along for such purposes, but before we had rounded the bows of the *Thorshavn*, the sea grew rough, and the waves began to break over the motor boat, wetting us to the skin. So suddenly can it change in the Antarctic from calm and sunny weather to storm! Like sensible people we put back to the ship and found it a tough job to get on board again, owing to the heavy seas.

We had to lose no time in getting out of the ice, which threatened both ship and cargo, so the course was set north for Lars Christensen Land. We continued to make soundings wherever the map was blank, and we also confirmed the fact that the barrier from Sandefjord

Bay north to Thorshavn Bay ought to be placed about 12 nautical miles further north.

We found an excellent airport in Thorshavn Bay, and on January 28 a couple of flights were made, with a view to mapping Lars Christensen Land. The first expedition went eastwards to 73° E. where the plane was forced to turn back on account of snowstorms. The other went west to the Gustav Bull mountains where a new peak, about 1,050 meters in height, was observed toward the south. Photographing and mapping were carried on during the whole time. At night we lay in a safe ice harbor.

We very much wished to attempt a landing, and when on January 29 we lay off Gustav Bull's mountain at about 64° E. everything was in order for a raid on the shore. On January 30, 1937, at 2 a.m., I had the great joy of setting foot on the Antarctic mainland; I must confess that I felt as excited as a boy about it!

After passing a belt of pack-ice, the *Firern* reached open water on January 31 at 66° 17' S., 57° 50' E., between Kemp Island and Enderby Land.

The plane was got ready, and Widerøe and Romnæs set off. They had been under the impression that we were close to land, but the supposed land turned out to be only a gigantic iceberg. The actual land lay about 50 kilometers further south and west than was indicated on the existing maps.

The plane headed for the Framnæs mountains and they started charting at about 64° 30' E. This linked them definitely up with the extreme westerly position at which they had arrived on January 28.

They sighted large mountain-ranges and peaks, and could see that the whole of Kemp Land was filled with mountains of no great altitude, stretching right out into the sea, as was also evident from the letters previously published by Mawson. The coast is composed of large bays and innumerable islands. This flight covered a distance of more than 800 kilometers. Widerøe would willingly have attempted a longer flight inland, but unfortunately the clearing began to freeze over towards evening, so that the *Firern* was obliged to move out into the open sea.

It was now February 1, and we could no longer have the whaler *Firern* at our disposal. The plane with the aviators and Captain Mikkelsen returned to the *Thorshavn*, and the *Firern* rejoined the factory *Ole Wegger* under command of its own captain. One evening, when the wind had entirely dropped, I had been talking to the captain of the whaler. "It really is quiet this evening," I said. He smiled. "Quiet? No, Consul, a whaler is never quiet. If you sell it some day to be made into nails, you'd better insist that they must be screws. Otherwise, I'm hanged if the nails won't roll out of the walls—this chap is so accustomed to heave and toss about!"

Before the *Firern* left us on February 1, Widerøe had accomplished seven flight-hours in the course of the morning, and had flown 1,400 kilometers along the coast from 58° E.; had charted as far as the west of Proclamation Island, so that the whole coast from the West Barrier at 86° E. to Enderby Land at 53° E., totalling altogether 1,600 kilometers, had been charted. The first stage was duly completed.

* * *

We passed Cape Ann, in Enderby Land, on February 2, and as we could not find any clearings in the pack-ice, which was unusually dense here, we continued west to Queen Maud Land. There the plane went up on February 4 with my wife as passenger. She proved to be both a good and successful observer, for on this trip they discovered unknown land between 40° and 35° E. The Norwegian flag was dropped at 38° E., 60° 30' S. The territory afterwards received the name of Prince Harald Land, after the Norwegian heir apparent.

Next day the *Thorshavn's* position was 34° E., 67° 50' S. Two flights were made. There was a heavy swell running, and the third mate, commanding the lifeboat which assisted in landing and starting the plane, said, "I could see nothing of the plane when we were down in the trough of the seas!" Widerøe also said that he could never have

believed it possible to land and start in such a sea, if he had not been there himself.

During the first flight on February 5, the whole of the newly discovered land was mapped, from 40° to 35° E. It consists of a chain of mountains. The second flight passed over Princess Ragnhild Land, which was discovered by Commander Riiser-Larsen on February 16, 1931. But when I came south in the *Thorshavn* in 1933-34, one of my gunners said to me, when he was on board drinking coffee with us, "You know, Consul, I saw Princess Ragnhild Land before ever that fine navy captain threw down his flag on it! I saw it from the factory, but they only laughed at me. D'you know what it looked like? For all the world like a badly-baked loaf of bread!"

Widerøe and Romnæs were now to map this "loaf." It was quite a well-shaped loaf, after all! Huge mountain-ranges were seen, with peaks up to 4,000 meters high. But the mountains lay 70 miles from the ice-edge, so it was not very surprising that no one had seen them previously, or that anyone had formed a mistaken impression of the profile of the land. While the flight was in progress, the *Thorshavn* steamed slowly round in a wide circle, thus keeping the broken ice apart, and the clearing open for landing on the return of the plane.

Our last flight was made on February 6. Our position was $69^{\circ} 15' S.$ and $26^{\circ} E.$ The flight was made over Crown Princess Märtha Land, the course being laid across the inland ice towards the nearest mountains. Fresh mountain formations were constantly emerging, and finally proved to be an extensive and unbroken range of mountains over 300 kilometers in length, and presumably from 2,000 to 3,000 meters in height.

On February 7, the *Thorshavn* headed definitely for home. All the flights had been made between January 16 and February 6. There had been altogether 44 flight-hours over regions measuring in all 10,000 kilometers. There had been no mishaps of any kind; 2,200 pictures had been taken with the mapping camera, in addition to individual photographs and cinematograph films.

The alliance between the whaler *Firern*, the plane, and the tanker *Thorshavn* worked out just as we had hoped. Without the mechanical aids afforded on a large scale, the plane could not have accomplished very much. Without the plane, our knowledge of the east coast of the Antarctic would have remained superficial. Captain Klarius Mik-



Where the Expedition Had an Airport Outside of Ingrid Christensen Land

kelsen's and Nils Larsen's experience and great interest in our work were of incalculable help. Flying and photography were carried out in a thoroughly competent way.

When we started on our return journey on February 7, the *Thorshavn's* position at noon was $69^{\circ} 30' S.$, $20^{\circ} 45' E.$ It was not far from Biscoe's position when, in his diary on February 5, 1831, he mentions that he believed he had sighted land. We were one degree farther south than Biscoe. He could not have seen any land from his position. His first view of it, as I have said, was on February 28, at Cape Ann on Enderby Land.

I was reminded of Biscoe in another connection. Everyone has returned safely from all my expeditions. This was, unfortunately, not the case a hundred years ago. When Biscoe's own ship, the *Tula*, reached Hobart in Tasmania on May 10, 1831, only Biscoe himself, two of his officers, and the ship's boy were able-bodied. All the rest of the crew were so ill that they could not stand up without help. Only one man, the carpenter, had died. Matters were even worse on board his other ship, the *Lively*. When it was wrecked at Port Phillip—later Melbourne—out of the whole crew only the captain, one sailor, and a little boy were alive. All the others, seven men, were dead.

Modern technique has enabled us to master the caprices of the sea and the ice, and ensured us almost 100 per cent security. And modern physiological chemistry has practically banished the specter of scurvy from the category of the possible mishaps of Arctic travel. But I would like to say that the more free from peril our work in the Antarctic becomes, the greater is our admiration and respect for men like Biscoe, Avery, and all those other brave, patient, and resolute pioneers in the Arctic and the Antarctic.

Norway has, perhaps, had more of them than any other nation. If by my work in the Antarctic I have been able to honor the memory of such men—irrespective of their nationality—I shall feel satisfied.

Courtesy of

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The Rannvik Mountains on Ingrid Christensen Land. The Black Spots Among the Mountains Are Tiny Fresh Water Lakes Which Are Free from Ice

CHKALOFF, WHO FLEW OVER POLE, IS KILLED

Soviet Airman Dies in Crash as He Tests Plane

MOSCOW, Dec. 15 (P).—Valery Chkaloff, one of the three Soviet Russian aviators who flew across the North Pole from Moscow to Vancouver, Wash., in 1937, was killed today in a crash while testing a new plane.

Chkaloff, 34, was chief pilot of the 5,400-mile transpolar flight, which ended at Vancouver July 13, 1937, sixty-three hours after taking off from the Russian capital.

Chkaloff and his companions, Georgi Baibukoff, co-pilot, and Alexander Bellakoff, navigator, returned home to be decorated as "heroes of the Soviet Union."

He joined the Red army at the age of 15 and, in 1921, entered the army flying school. He later became test pilot.

MOSCOW, Dec. 16.—The death in an airplane crash yesterday of Valery Chkaloff, who placed his name among the greatest heroes of aviation last year when he piloted the first Soviet plane over the North Pole to America, has evoked the deepest and most sincere grief of any event in Russia since the destruction of the airplane Maxim Gorky and the death of all forty-nine aboard in 1935.

The greatest possible honors were accorded to him officially and in the press today, but the sorrow of the people themselves was even more impressive.

The aviator's body was placed in state today in the Hall of Columns of the old Nobles' Club, where Lenin once lay. Men prominent in the army, navy and aviation took turns standing as a guard of honor beside the flower-laden catafalque. Long lines of people waited for hours shivering in a bitter wind of 20 degrees below zero for a turn to pass through the building to get a brief glimpse of the hero.

Soviet papers today devoted most of their space to Chkaloff, but as yet there have been no details of the fatal accident beyond the meagre fact that he was killed while testing a new type of military airplane.

MOSCOW, Dec. 18.—The ashes of Valery Chkaloff, pilot of the first transpolar flight to America who was killed in an aviation accident last Thursday, were sealed in the Kremlin wall today with all the pomp and circumstance with which the Soviet honors its greatest dead.

Joseph Stalin himself was among these who, to the slow measures of a funeral dirge, carried the catafalque containing the urn from the Hall of Columns, where Chkaloff had lain in state throughout yesterday and this morning, to Red Square and to its final resting place near Lenin's Tomb.

Before Chkaloff's ashes were taken to Red Square 350,000 men, women and children braved the cold to stand in line outside the former Nobles Club for an opportunity to file through and gaze swiftly at Chkaloff's features, or this morning—as the body had been



Valery Chkaloff

cremated during the night—merely to look at the urn containing his ashes.

Most of the Soviet great, including famous aviators from Mikhail Vodopyanoff down took turns in the guard of honor beside the red-draped bier. In the last guard of honor before the ashes were taken to Red Square stood Mr. Stalin, Mr. Voroshiloff, Premier Vyacheslav M. Molotoff, President Mikhail I. Kalinin and Vice Premier Lazar M. Kaganovitch.

They with others of the Soviet great took turns at bearing the catafalque on their shoulders to Red Square, some three city blocks distant. There they stood patiently and reverently atop Lenin's Tomb during the obsequies. Their breaths froze to fog at every exhalation. In the square in front of the tomb troops, drawn up at attention, danced up and down, still at attention, to keep their feet from freezing.

A few speeches, mercifully short, were delivered from the tribune atop the mausoleum. One of them was by Georgi Baidukoff, who was Chkaloff's co-pilot on the flight to America.

At the close of the ceremony the catafalque was taken from its place of honor before the tribune through a fir-burdened path to the Kremlin wall where the urn was interred. A salute of twenty-four guns ended the ceremony.

MOSCOW, Dec. 26 (P).—The presidium of the Supreme Soviet decided today to honor the late Valery Chkaloff, who flew with two other Russian aviators from Moscow to Vancouver, Wash., in 1937, by renaming the city of Orenburg in his memory. Chkaloff was killed Dec. 15 in a crash while testing a new plane.

Besides deciding that Orenburg, a city of 144,000, should be known hereafter as Chkalovsk, the presidium renamed the region of Orenburg after the flier and the Council of People's Commissars ordered other honors to him as follows:

BRITON LOSES LIFE IN ARCTIC ICE PACK

Word of Death of R. J. O. Bray, Scientist, Is Brought by Eskimo

CHURCHILL, Manitoba, Dec. 28 (Canadian Press).—Word of an Arctic tragedy which cost the life of a young British scientist three months ago reached this Hudson Bay post today from the wastes beyond the Arctic Circle.

A wireless report told of the death of R. J. O. Bray, 28-year-old ornithologist, when his small boat was crushed by an ice pack in September 200 miles north of the Circle.

Mr. Bray was exploring with another English scientist, Patrick Baird, when the accident occurred.

Mr. Baird managed to scramble to safety on the ice and make his way to Igloolik, but Mr. Bray died in the icy waters of Foxe Channel, north of Melville Peninsula. Igloolik is a near-by island outpost.

Word of the tragedy was carried by an Eskimo from Igloolik to Repulse Bay, 600 miles north of Churchill, and flashed by radio to this Hudson Bay post.

Mr. Bray was on his second trip into the Arctic with a Canadian-British expedition to study the geology and natural life of the Far North and to seek traces of earlier Eskimo civilizations.

Since Mr. Bray's death a third explorer has gone north to join Mr. Baird at Igloolik. He is G. W. Rowley, who went to Repulse Bay by boat last Autumn and then struck north with a dog-sled intending to meet the other explorers.

A graduate of Oxford, Mr. Bray is survived by his wife in England and a daughter born Aug. 10, just three days before he left Churchill for the Arctic.

DAUGAARD-JENSEN, 67, DANISH POLAR CHIEF

Greenland Board Head, Known as 'Father' of Eskimos, Dies

COPENHAGEN, Nov. 27.—Jens Dagaard-Jensen, director of the Greenland Administration Board, died here today of pneumonia at the age of 67. For more than twenty-five years he was managing director of Denmark's huge Polar colony and was considered the "father" of the Eskimo population because of his work in protecting them from exploitation. During his administration he rendered many services to American explorers and aviators.

Jens Dagaard-Jensen was one of Denmark's outstanding civil servants. He entered government service when he was a young man and was a Minister Plenipotentiary before he was 30 years old.

In 1900 he became inspector of North Greenland and in the years he spent in that territory attained a wide knowledge of its geography and its problems. He was frequently called upon for advice by explorers and aviators. Colonel Lindbergh and his wife were his guests at Julianehaab, Greenland, in August, 1933. As chief of the Royal Danish Greenland Board Mr. Dagaard-Jensen was making his an-

nual inspection trip in the motorship Disko. Also present at that time were representatives of the Italian air force who were in the region making preparations for General Balboa's flight.

JACK O'BRIEN, AIDE ON BYRD EXPEDITION

Surveyor on Antarctic Trip of 1928-29 Dies Here

Jack O'Brien, surveyor for the Byrd Antarctic Expedition of 1928-29, died Dec. 6 in his apartment at 400 East Forty-ninth Street, after an illness of six months. Last Summer friends gave him several blood transfusions. He was born in Duluth, Minn., forty-two years ago.

After attending public schools in Minneapolis and the University of Minnesota, Mr. O'Brien served in the United States Army, cavalry and air service, for three years, 1915-18, attaining the rank of sergeant, first class. Later he made prospecting expeditions in Mexico and Canada. On the Byrd expedition he was an assistant to Professor Lawrence M. Gould, head of the geographical staff.

LIEUT. TRUDEN, AIDE ON POLAR EXPEDITION

PITTSFIELD, Mass., Feb. 15.—Lieutenant John Napoleon Truden, member of the Fiala-Ziegler Arctic expedition in 1903-05 and a Spanish American War veteran, died today in St. Luke's Hospital of a heart malady. He was 66 years old.

A native of Pittsfield, Lieutenant Truden served for eighteen years in the United States Army. He fought Indians in South Dakota and was in the Philippines from 1898 to 1901.

Lieut. Truden's next adventure came when he was placed second in command of the two unsuccessful Arctic expeditions financed by William Ziegler, Brooklyn millionaire.

In the steamer America the party left Trondhjem, Norway, on June 23, 1903, under Anthony Fiala, whom Ziegler had commissioned to find the North Pole. The steamer was crushed in the ice and either drifted away or sank in Teplitz Bay, off the northern part of Franz Josef Land the following January.

Fiala then went north across the ice, while Lieut. Truden, with twenty-five men, returned by dog sled to Cape Flora, at the southern tip of Franz Josef Land. There, with seven other men, Lieut. Truden lived in a fourteen-foot-square shack from Sept. 24, 1904, to Aug. 1, 1905, when the Ziegler rescue ship Terra Nova arrived and saved the expedition. Fiala also was rescued.

Had to Eat Ponies

During nearly a year of virtual imprisonment in the shack the party ran out of rations, ate its two ponies and finally lived on polar bear meat, when hunting was good. In an effort to put aside the thought of death, which Lieut. Truden believed was their certain fate, he established a camp "newspaper," which carried a cartoon captioned "Rebecca Waiting at the North Pole." It showed an impatient girl, out of sorts because the expedition failed to arrive.

Soviet Ship Sets Record in Drift to Pole; Disabled Craft Farther Than Fram's Mark

MOSCOW, Feb. 18.—The Soviet icebreaker Syedoff has gone farther north than any other seagoing vessel, exceeding the record of Fridtjof Nansen's Fram in her trip across the polar basin nearly half a century ago.

At 1:25 P. M. Moscow time yesterday, according to an announcement by the Soviet official radio tonight, the Syedoff arrived at Lat. 85 degrees 56 minutes 42 seconds N., Long. 120 degrees 13 minutes 20 seconds E. This is 1.2 miles closer to the Pole than Nansen attained in his voyage, lasting from 1893 to 1895.

Thus the Soviet explorers scored their first record in their trip, accidentally begun fifteen months ago when the Syedoff lost her propeller in an ice jam and could only float helplessly. They hope to score an even greater one, for the direction of the Syedoff's drift is now directly toward the Pole and she may pass over it before her strange adventure is finished.

A wireless message to Moscow from Captain K. Badigin told of the joy of his crew of fifteen. As the Syedoff passed the Fram's northernmost point the crew lined up on the bridge and saluted with the rifles they had been using to defend themselves against marauding Polar bears. The sky was heavily clouded and the thermometer stood at 32 below zero.

"For several hours," the Captain reported, "the crew looked out over a region never before visited by a ship in the history of humanity."

Until recently the Syedoff—propelled only by winds and current—passed through broken ice, rearing up in huge groaning blocks which at times almost capsized the little vessel. But recently colder weather froze the area around the Syedoff into one solid field.

Officials of the Northern Sea Route Administration are discussing sending the Syedoff a new party and further supplies by plane when the weather permits. The fifteen aboard are all volunteers who declined to be taken off by plane when the Syedoff and two companion ships were frozen in during the Fall of 1937. All fifteen aboard are in good health.

MOSCOW, Feb. 19.—The crew of the disabled Soviet icebreaker Syedoff, which has now drifted to within 275 miles of the North Pole—the farthest north ever reached by any vessel—has declined the offer of the Soviet authorities to relieve them by airplane and deposit another crew aboard.

After two grim Winters on a voyage of discovery that began accidentally when the ship lost her propeller in an ice jam, the crew wish to remain at their posts until they cross the Polar Basin, possibly the Pole itself, and emerge into open water. This is expected to be along the Greenland coast whither currents carried Fridtjof Nansen's Fram in 1895 and the Soviet North Pole expedition last year.

MOSCOW, Feb. 20.—The drift of the Soviet icebreaker Syedoff across the polar basin is continuing

at increased speed and in the general direction of the North Pole. The vessel's position at 1 o'clock this morning was reported by the ship's wireless to Moscow at Lat. 86 degrees 2 minutes N., Long. 119 degrees 15 minutes E.

This is about four miles farther north than the northernmost point reached by the Fram, which in Dr. Fridtjof Nansen's drifting voyage from 1893 to 1895 approached nearer the North Pole than any other ship until the Syedoff exceeded it last Friday.

The scientists aboard the Syedoff have records of Dr. Nansen's voyage and are comparing their findings with his. They believe that the composite picture given by these two voyages of exploration will enable them to explain many Arctic phenomena. Among them are polar air currents that influence the weather over much of the earth's surface.

Ivan Papanin, leader of the successful icefloe expedition, has written a newspaper article, "The Arctic Is Ours," which appears today in celebration of the first anniversary yesterday of the removal of the Papanin expedition from the floe. He emphasized that the wealth of scientific findings of his North Pole expedition is now being reinforced and supplemented by the Syedoff party's studies.

One of the most interesting of them is the unexpected wealth of living organisms in the northernmost waters. Dr. Nansen had concluded that there was little organic life in the polar region because thick ice prevented sunlight from penetrating into the water.

But the new Soviet observations show that microscopic animal and vegetable life, which serves as food for higher life, exists in considerable abundance even at depths of 10,000 feet in the polar sea.

The Sedov froze solidly in the ice on October 23, 1937, while on an exploring expedition north of the New Siberian Islands in the Arctic.

Alaska-Siberia Tunnel Predicted by Russian

MOSCOW, Jan. 11 (UP).—Outlining the Soviet Union's planned system of railroads, Professor V. Obravtsov, Soviet scientist, writing in "Komsomolskaya Pravda," Young Communist newspaper, predicted today that a railroad tunnel or system of bridges might be built some day across the Bering Strait to link Alaska and Siberia.

He added that the time was not distant "when trans-Arctic flights between Russia and America will become regular, and the line between Moscow and New York will be one of the great traffic systems of the world."

Fifteen men were left on board, out of more than forty who volunteered. The Josef Stalin, a 10,000-ton ice breaker—the largest in the world—which was launched last summer at Leningrad, broke its way as far as 83 degrees of north latitude, but was forced to turn back when the sun appeared for only two hours every day. The Sedov was left to face its second winter in the ice.

It was at this point, apparently, that it was decided to turn a liability into an asset. The Arctic has become more and more the frontier land of the Soviet Union, and a small ship pinioned in its ice, headed apparently for the North Pole, proved to be a perfect symbol for the excitement with which all Russians look at the north.

The Bolsheviks have every hope of salvaging their ice breaker eventually. Already they have made a national adventure out of what was originally a mistake of planning and leadership. The fifteen men left on the ship, headed by Captain Constantine Badigin, a twenty-eight-year-old peasant boy who made good in the Soviet Navy, have already become Arctic heroes in the

tradition of Ivan Papanin and Mikhail Gromov.

The Sedov's drift has so far been more to the east than that of Nansen's Fram, which finally drifted into Spitzbergen after just missing the North Pole in three years of drifting through the Arctic. The Sedov in its first year has covered more than 1,500 miles and moved 520 miles northward. On the average it has moved four miles a day; wind observations have proved that a strong current is moving the ship, independently of the wind, toward the North Pole.

Good Reading by Radio

Its sailors send weather reports four times a day by radio, and enough details about the Arctic night now closing down around them to make good reading for the Soviet public. Polar bears have twice smashed the tent, 700 yards from the ship, where magnetic observations are made. An occasional bird has been seen; specimens of ocean water have been found full of microscopic plant life at almost every level.

The November 7 anniversary of the revolution was held at noon in the deep twilight, which is now both day and night for those on the Sedov. The ubiquitous Communist party organizer, who is also chief mechanic, organizes political discussions among the crew. Some of them are learning English, others to play the piano or the guitar.

Among their provisions are six live pigs, brought to them last August by the Yermak. They are supplied with a wooden house ready for erection on the ice if the boat should be crushed, ample reserves of coal and canned or concentrated food enough to last for two years.

When they had completed a full year in the ice, last month, Stalin himself sent them a radiogram of congratulations. It will surprise no one in Moscow if a squadron of Arctic planes were sent to greet them, especially if they should be near the North Pole, as soon as Arctic flying starts next spring.



The Sedov seen from another ice breaker in the White Sea. Note "refrigerated" beef in rigging

World Climate Growing Warmer, Say Russians, Citing Arctic Data

MOSCOW, Dec. 11.—The findings of Soviet explorers aboard the icebreaker Syedoff, now drifting within 300 miles of the North Pole, together with earlier observations by other investigators, have caused Soviet scientists to conclude that the Arctic region and, indeed, the whole world is growing warmer.

This conclusion was voiced today in reports published separately by Professor N. N. Zupoff of the Meteorological Institute of the Northern Sea Route Administration, and Professor L. Berg, corresponding member of the Soviet Academy of Sciences. They are cautious about deducing causes or prophesying the duration of the change of climate.

Professor Berg recalls that the ice age 3,000 to 5,000 years ago was followed by an epoch in which the average Summer temperature was higher than now.

"Are we witnessing the approach of such an epoch," he asks, "or have we to do here with a climatic fluctuation the period of which is only some decades? No answer can as yet be given."

Both scientists mention the Gulf Stream as a possible cause of the rising temperatures but agree that this can at most be contributory—that other factors are causing a rise in the temperature of the Gulf Stream, which carries warmer water northward. They give considerable credence to the theory that climatic change may be due to increased heat from the sun either because solar radiation has been intensified or because resistance by the earth's atmosphere to the sunrays has been reduced.

The Syedoff's scientists are finding that warmer polar water is hastening the melting of ice and causing a faster flow of ice in the polar basin. The Syedoff is drifting two to three times faster than did the exploring ship Fram when Dr. Fridtjof Nansen made his famous drifting voyage in the icepack across the polar basin in 1895, reaching the northernmost point of 85 degrees 57 minutes latitude.

According to Professor Zuboff, the average Winter temperatures along the coasts of Baffin Bay, Greenland, the Bering Sea and the Kara Sea have been steadily rising since 1920. The average temperatures throughout Europe also have been rising. Thus Soviet ships have been able to penetrate ever farther northward, as exemplified by the record-breaking free-sailing voyages of the Sadko in 1935 and the Yermak this year.

Codfish—lovers of relatively warm water—are now appearing along the coasts of Nova Zembla, Spitsbergen and other far northern points, Professor Zuboff reports. Other warm-water fishes have appeared in the northernmost parts of the Bering Sea, to which they were strangers at the beginning of the century. Professor Zuboff adds that the temperature of the Atlantic was a record high last September and that there is no sign of a diminishing tendency in the Arctic temperature rise. The warming process is apparently tak-

ing place in the Antarctic, but less is known about it, he says.

Professor Berg's report summarizes the findings of scientists of many countries to prove that average temperatures have risen over the whole world, including Europe, North America, the Southern Hemisphere and the tropics. He cites data from Russia itself, including reports of travelers of a century ago, of frozen ground in Northern Russia many miles below the point at which the soil freezes now.

Observations are being taken by the Syedoff on the uncertain footing of a grinding ice pack and under great difficulties. Polar bears constitute a minor problem. Every evening a member of the Syedoff party takes magnetic observations some distance from the ship to be free of the ship's iron. Each time a companion goes along with a rifle, taking a post far enough away so that the steel barrel will not interfere with the observations.

Without such precautions the observer, engrossed in his work, might be pounced on and killed. Several bears have been encountered and they have provided fresh meat for the Syedoff party.

The Syedoff has supplies for about a year and a half yet. The supplies are distributed in a number of small depots on the ice in the vicinity of the ship, so if one depot is destroyed by the ice movement the others remain.

MOSCOW, Jan. 16.—Observations taken by the little scientific party on board the Syedoff, Soviet icebreaker that is accidentally making a polar expedition because it got caught in the ice fifteen months ago, are confirming the findings of the late Dr. Fridtjof Nansen on the polar ship Fram nearly a half century ago that wind is the major factor in the speed and direction of ice floe movements.

This explains why the Syedoff has made no progress northward in the past two months but has followed a tight spiral course westward, just north of the eighty-fourth parallel. It has been buffeted by winds from every direction, though mainly from

Soviet Shifts Schmidt To Science Academy Post

MOSCOW, March 10.—Professor Otto J. Schmidt, under whose direction Soviet scientists and aviators have carved out an empire in the Arctic, has been relieved of his duties as chief of the Northern Sea Route Administration and appointed vice president of the Academy of Sciences, according to an announcement today by the Council of People's Commissars.

His successor is Ivan Papanin, who won world fame as head of the North Pole drifting station and became vice chief of the Northern Sea Route Administration on his return. Pytov Shirs-hoff, also of the North Pole party and later director of the All Union Arctic Institute at Leningrad, becomes vice chief.

Professor Schmidt's transfer is understood to have no political significance. His new post is even higher ranking than that he relinquishes.

A purging of the Northern Sea Route Administration a year ago gave rise to an erroneous report that Professor Schmidt was in disgrace. He now leaves a post in which he has added greatly to Soviet renown in the hands of an energetic and gifted successor.

the north, and it has been pelted by blizzards.

From its northernmost position of Lat. 85 degrees 39 minutes N.—only a few miles short of the northernmost point reached by the Fram—and Long. 126 degrees 16 minutes E. on Nov. 14, it has now by a series of small loops reached a position, according to the latest data obtained today by the Northern Sea Route Administration, of Lat. 84:38 N. and Long. 123:16 E.

However, Professor Nikolai Zuboff of the administration explained today that capricious winds of the past two months had given way to stabler weather and that the Syedoff's movements were now controlled more by ocean currents. The

twisted smile to the audience of Northern Sea Route Administration employees. The sentence was more severe than many spectators had expected in view of the care taken to let the defense get extenuating circumstances into the record.

The court ruled that Voznesensky had been guided by counter-revolutionary designs in going on a virtual sit-down strike for two days before Levanesvsky took off and continuing it for two weeks. In so doing, the court referred to the psychiatrists' report that Voznesensky was nearly enough normal to be responsible for his actions.

Voznesensky, addressing the court before the judges retired to consider their verdict, admitted his eccentric actions had constituted wrecking, but said he did not understand this at that time, but only later realized the seriousness of deserting his post in the Arctic at such a critical time. He asked the court to accept his repentance and give him a chance to show his devotion to the Soviet Union by honest work.

sea water where the Syedoff is drifting moves at a rate of about a mile and a quarter every twenty-four hours northwestward. Thus it is still likely that the Syedoff will beat the Fram's record of being the northernmost ship and possibly the Syedoff will cross the North Pole itself.

The fifteen members of the Syedoff party are having a good deal of fun, besides making regular observations. Nightly they listen to musical programs and political dissertations from Moscow by radio. Occasionally there is a movie show.

Their cabins are warm; they bathe regularly, take long walks on the ice pack and occasionally shoot a polar bear to vary their diet, which, they report, is ample and healthful.

POLAR CREW FOOD IMPERILED BY ICE

Russians Save Supplies After Pack Rears Up, Smashing One of Their Depots

MOSCOW, Jan. 18.—For the second time in the past two months the crew of the icebreaker Syedoff, drifting across the polar basin, has been threatened with the loss of food and fuel supplies. Fissures suddenly formed in the ice pack and a mountainous heap of ice bore down upon a supply depot near the ship.

The ice pack crushed a corner of a tent in which hydrographic observations were made, but everything was saved except a few carpenter's tools. The Syedoff's party, like Ivan Papanin's ice-floe expedition, has its supplies distributed among several depots on ice surrounding the ship.

On Monday, with a moderate southwest wind blowing and the temperature at 15 degrees below zero, the ice began grinding harder than usual. Men at the hydrographic tent fired a warning rifle shot and all of the crew except the captain on deck watch and a radio operator went scrambling over the broken ice to the rescue.

They arrived just as the ice-heap charged down on the tent. For five hours the crew labored, digging food cases and barrels of fuel oil from under the ice and bearing them away to a new depot.

A radio message reporting this said the Syedoff's position that day was Lat. 84.46 N., Long. 124.16 E., showing that the vessel was still moving northward toward the polar ship Fram's record. It added that all were well and that the crew was in a lusty mood.

Planes and Propeller Sleds Will Deliver Arctic Mail

MOSCOW, Feb. 4 (UP).—Exploring parties, lonely reindeer herds-men and radio operators in the Soviet Arctic and the wilderness of eastern Siberia will benefit from a new regular air mail service soon to be established.

Letters and papers will be dropped from the air to an appointed landmark and parachutes will deliver parcels. Propeller-driven sleds, which will scoot across the snow at 60 miles an hour, will make deliveries to remote villages and settlements.

RUSSIAN RADIO MAN GETS TWENTY YEARS

Operator Who Quit Post During Levanesvsky Flight Sentenced

MOSCOW, Feb. 27.—Mikhail M. Voznesensky, former radio operator at the Rudolf Island Arctic station, was sentenced this evening to twenty years' imprisonment for disrupting radio communication at the time Sigismund Levanesvsky and five companions were on their ill-fated attempt to fly over the North Pole to America in August, 1937, and during the period when rescue expeditions were being organized.

The wizened little fellow, whom medical experts described as hysterical and ill-adjusted, stared at the floor as the chief judge read the sentence. Then as five NKVD guards escorted him out he shrugged his shoulders and gave a

RUSSIANS WRITING NEW EPIC IN ARCTIC

Icebreaker Drifting Toward a Record Near Pole as Crew Gets Scientific Data

MOSCOW, Dec. 17.—Another epic of Arctic exploration is being written day by day as the Soviet icebreaker Syedoff zigzags along the eighty-fifth parallel, moving northward for a time and then slipping southward on an adventure begun by accident, but which may carry it over the Pole itself.

Frozen fast in the ice fourteen months ago, helpless with a broken propeller, it has drifted now to a position only a few miles short of the record made by Dr. Fridtjof Nansen in the polar ship Fram in 1895, which approached closer to the Pole than any vessel had ever been before or since.

The Syedoff's skeleton crew of fifteen men is daily taking meteorological observations, sounding the seawater and gathering magnetic data to fit into the vast mosaic of information about the Arctic to which hundreds of Soviet scientists are continually adding from sixty stations dotting the whole vast expanse of the Soviet Arctic. Daily their reports come crackling into Moscow by wireless and are woven into a coherent picture of this "weather factory of the world."

Exploits Are Spectacular

No enterprise of the Soviet regime has afforded so many spectacular exploits—the establishing of Ivan Papanin's camp at the North Pole and the flights of Soviet aviators over the pole to America, to mention only a few—as the Northern Sea Route Administration.

But spectacular feats are only part of the day's work of the organization, which has undertaken conquest of the Arctic for practical reasons. The Soviet Arctic is incredibly rich in coal, iron, gold, timber, nickel, apatite and other important resources. Its waters teem with edible fish. Food crops are being grown successfully within the Arctic Circle.

The Soviet regime has developed a sea route north of the whole land to bring these riches into exploitation. Within the past four years Soviet ships have begun making regular commercial voyages from Murmansk to Vladivostok. About 200 vessels now ply these forbidding waters.

New cities have sprung up where a few years ago there were only scrawny settlements or frozen wastes. Men, women and children have emigrated there and established mines, factories, stores, newspapers, hospitals, theatres—everything one finds in Russian towns further south.

Murmansk, for instance, has grown in twelve years from a town of 9,000 to a bustling metropolis of 100,000. Shipyards, docks and warehouses have been built to take care of heavy freight traffic that goes on all year around because Barents Sea, warmed by the Gulf Stream, is always open.

Near by is the base of the Red Navy's White Sea fleet. A big dry dock is being constructed. Mechanized trawlers basing at Murmansk catch herring and bring them to canning plants ashore. Near apatite mines the city of Kirovsk, now harboring 40,000 inhabitants, has risen in the past few years. Others have mushroomed similarly until now the Kola Peninsula alone has 262,000 inhabitants.

To keep sea lanes open the Soviet Government has built a fleet of powerful icebreakers, of which the Syedoff is one. To aid navigation it has set up weather stations and sent airplanes on daring flights to observe and report on ice conditions.

Thus, from purely practical motives, the Soviet Union has established a proving ground for aviators and scientists whose achievements have thrilled the world.

ICEBREAKER EXPECTED TO DRIFT SOUTHWARD

Soviet Scientist Thinks That Syedoff Won't Reach Pole

MOSCOW, March 4.—The Soviet icebreaker Syedoff, fast frozen in the polar ice pack, continues to move almost steadily toward the North Pole. Its last-reported position, Lat. 86 degrees 20 minutes N., Long. 115 degrees 20 minutes E., given at 1 A. M. yesterday, was approximately 250 miles from the Pole.

Soviet scientists who at first believed that the Syedoff might cross the Pole itself now doubt that it will do so. According to Professor Nicolai N. Zuboff, the northernmost points of the Syedoff's polar voyage, which began accidentally when the ship was caught in the icepack with a lost propeller in the Autumn of 1937, will probably be the eighty-eighth parallel, which is only 140 miles from the Pole. After that, Professor Zuboff thinks that the Syedoff, whose drift is determined by ocean currents and wind, will continue southwest and emerge, as did Ivan Papanin's North Pole station, off the Green-

SHIPS LOCKED IN ARCTIC ICE

IN the wastes of the Arctic Ocean a wireless set recently stuttered. A receiver hundreds of miles south of the Circle picked up the signal, and soon, by telegraph and cable, word was flashed about the globe that the Soviet icebreaker Syedoff, caught in pack ice, had drifted to within 275 miles of the North Pole. This is the farthest north ever attained by any ship.

For the Syedoff this is the second year of involuntary wandering across the top of the world. If her luck holds, she will join the honor roll of vessels which have felt the crushing embrace of Arctic ice and survived. Her crew have proclaimed to the Soviet Government and to the world that they are resolutely determined to remain aboard until they cross the Polar Basin, possibly the Pole itself, and reach open water. Apparently they expect to emerge from the ice somewhere along Greenland's coast.

For many ships and men the ice has meant tragedy and death, or at the least a Winter of privation and discomfort. As early as 985, records show, Eric the Red, leading a colonial expedition to Greenland, lost five ships in the grinding floes. John Cabot and Henry Hudson knew the ice well, and Hudson is believed to have died in it after drifting for days in an open boat.

Early in the nineteenth century Captain John Ross, searching for the Northwest Passage in the Victory, was caught for four

years in the ice. In the Fifties Dr. Elisha Kent Kane, an American, while searching for the ill-fated expedition led by Sir John Franklin, spent twenty-one months in the pack before abandoning his vessel.

Perhaps the most tragic of all Arctic expeditions was the one headed by Lieutenant George W. De Long, who on a voyage of exploration steered his ship, the Jeanette, into the pack north of Bering Strait in July, 1879. Two years later, the ship crushed by the pack, his expedition was almost completely wiped out in the return march to civilization.

STILL, the drifting ice has often been kind to those it holds so tightly. Payer and Weyprecht, leading the Austro-Hungarian expedition of 1873, were carried within sight of hitherto undiscovered rocks they named Franz Josef Land. On another occasion nineteen men, separated by the ice from the ship Polaris, drifted more than 1,500 miles in 196 days, eighty-six of them without sun, before being rescued.

Hitherto, the most ambitious and successful drift ever undertaken was that of Dr. Fridtjof Nansen, who in 1893 headed for the Pole in the Fram. The ship reached 85° 55' N. and returned out of the ice undamaged in 1896.

During recent years there have been few attempts, except by the Russians, to take advantage of the drifting ice.

land coast this Autumn.

Wireless messages from the Syedoff tell how the sturdy little ship with a crew of fifteen is drifting slowly though the twilight of an almost finished polar night. Under gloomy and cloudy skies the scientists are taking their varied observations in a temperature of 20 below zero.

But, according to Professor Zuboff's calculations, the polar dawn will break on the Syedoff in another week. The Syedoff's crew will celebrate it, as it did the Winter solstice in December, with a jolly party.

YOUTH IN ARCTIC AREA FIND MARRIAGE EASIER

Must Work Only Year Instead of Four for Father-in-Law

It was not the upkeep of a wife, but the first cost that brought complaints from Eskimo youth on one of Uncle Sam's Far-North island possessions. So St. Lawrence Island, 100 miles off the Alaskan coast in the Bering Sea, now has a new marriage law whereby suitors need work for prospective fathers-in-law only one year, instead of four, before claiming their brides. Furthermore, selecting a mate is no longer to be a family affair, but one in which young people may make their own choice.

"Change comes slowly to the remote top shelf of American possessions," according to a bulletin of the National Geographic Society. "Up near the Arctic Sea, only forty miles from the bleak shores of Eastern Siberia, St. Lawrence Island is a spot of land seldom visited by residents of the outside world.

"As a government reservation, about 100 miles long and averaging 20 miles across, this island rates four school teachers and a nurse, provided by the Bureau of Indian Affairs.

"Under a simple form of local rule, supervised by the Coast Guard and based on the primitive economy of the territory, native boards are elected in the main villages to run cooperative stores, set prices, give credit in bad times and to arrange for the sale of local products.

"To the four or five hundred inhabitants, however, even such elementary community interests are considerably less vital than the individual problems of making a living—hunting, fishing and trapping—under the harsh rules of the Far North.

"Largely meat-eaters, St. Lawrence islanders vary a diet of walrus, whale and seal with Summer rations of fish and fowl, served either boiled, dried, raw or sour—the latter resulting from decomposition after underground storage. Traditional delicacy is whale blubber and a unique side dish is made from fermented greens, frozen, sliced into shavings, mixed with seal oil and sugar, and then frozen again."

Arctic School Enrollment Gains

BARFOW, Alaska (AP).—Because of an influx of natives from the eastern Arctic coast, America's farthest-north school—the Indian Service Institution here—has five teachers and an enrollment of 200 pupils this season.

CANADA MOVES EAST FIRST REINDEER HERD

*Will Establish Ranching for
Eskimos on Big Scale*

OTTAWA.—The first native reindeer herd to be established in the Northwest Territories is moving eastward to the Anderson River area, according to radio advice received by the Canadian Department of Mines and Resources. This 150-mile overland drive of about 800 reindeer away from the government herd near the Mackenzie delta is being carried out under the direction of the chief herder at the government reindeer station, and marks another forward step in Canada's plan to establish reindeer ranching among the native population.

Upon arrival at their new range, the management of the native herd will be entrusted mainly to two Eskimos, Charlie Rufus and Rufus Kalealuk, who under departmental supervision will obtain an appointment to demonstrate their ability to herd reindeer. The younger of these natives, Charlie Rufus, has had about three years training as an apprentice with the government herd.

The native herd consists of good average stock, the animals varying from young fawns of 1938 to animals several years old. This herd is being loaned to the natives until such time as it has increased substantially in size, when it will then be decided whether a herd of 800 will be taken away to start a fresh enterprise in another suitable location. Experience has shown that it is not feasible to manage a herd of any less than 800 head.

In addition to lending the reindeer, the government is providing herd dogs and other equipment, as well as a quantity of rations to assist in maintaining the herders during the first year.

REINDEER PROVIDE FOOD

*Canadian Herd Found to Aid
Wild Life Conservation*

TORONTO (Science Service).—Canada and Alaska are discovering one incidental benefit resulting from their reindeer herds. Introduction of the herds has been a good conservation measure, the Ontario Research Foundation reports here. By providing Eskimos with a steady source of meat and cloth-

MacGregor Urges Arctic Stations For Weather-Forecast 'Science'

Permanent meteorological stations in the Arctic to "reduce weather from a philosophy to a science" will be recommended by Clifford J. MacGregor, commander of the MacGregor Arctic Expedition, on the basis of data collected during his long stay in the North, he revealed Nov. 22.

On his official return to government service at the United States Weather Bureau, 17 Battery Place, Mr. MacGregor, an authority on Arctic weather, said that with constant reports from stations in a large area now unreported within the Arctic Circle, general seasonal conditions could be foretold and day-to-day weather plotted three or four weeks in advance.

The predictions could be so accurate, he said, that agriculture and aviation would benefit greatly.

The meteorological expedition returned to the United States on Oct. 4 after an absence of fifteen months. In the months that their schooner, the General A. W. Greeley, was locked in the ice at Reindeer Point, near Etah, Greenland, the ten members of the expedition took weather observations hourly. Their reports to the Weather Bureau filled in a large area that had been blank.

Mr. MacGregor, who formerly was meteorologist at the Newark Airport, plans to spend the next month or six weeks working on his records and then will deliver some lectures. Other reports are at the division of terrestrial magnetism of the Carnegie Institute and with the Weather Bureau, both in Washington. It will take a year to compute the magnetic record, the meteorologist added.

He said that in his formal report he would recommend establishment of weather stations at scattered points over an area of 500,000 square miles or more around the North Pole region north of latitude 70.

"We found quite a permanent low up there," he said. "There is quite

a steady drift of polar air masses through the low area that brings cold air to the United States. A good share of our cold weather comes down from the polar air masses."

Mr. MacGregor declared this not only affected flying over the polar regions but, because Atlantic and east coast weather was affected, it was important to Atlantic flying.

He suggested that the United States station at Point Barrow, Alaska, be re-established "as a station of the first order" and that a meteorologist be kept there to make accurate reports. He added that six or more stations should be set up in the vast region northeast of Point Barrow. Each station could be established at a cost of \$15,000 and could be built in two or three months.

Not only would the great savings to agriculture and aviation from accurate seasonal and daily forecasts make the stations feasible, he continued, but other nations which would benefit similarly from such reports should cooperate in the undertaking.

Mr. MacGregor said one station could be set up at Thule, Greenland, about 100 miles north of Cape York, where a Danish store is maintained. Other points he listed were Devon Island, a Canadian possession; Melville Island, Ellesmere Land, Victoria Land and landpoints farther to the northeast.

The meteorologist said upper-air soundings were taken with balloons with air meteorographs attached and that this proved to be the best method, the visibility often being too poor for flying.

He reported seeing mirages in the Arctic wastes and said the expedition had a feeling of being outside the world. Nevertheless, the members heard news broadcasts in English from Prague, Czechoslovakia, he said, and "a great deal" of German propaganda intended for Africa.

Iceberg Reported Seen In Waters Near Honolulu

By The Associated Press.

HONOLULU, Nov. 10.—Science and personal observation clashed today over the reported presence of an iceberg in tropical waters 900 miles west of Honolulu.

Captain W. H. Barrows of the Pan American Philippine Clipper reported the iceberg.

"There are no icebergs in that area," reported Lieut. Comdr. J. H. Peters of the United States Coast and Geodetic Survey. "They must have mistaken an islet for an iceberg."

Captain Barrows, however, said half a dozen observers using binoculars all agreed the object was an iceberg.

"We know all the islands in that area, so we could not be mistaken," he said.

Commander Peters said an ice mass coming from the Arctic would have followed currents along the Pacific coast almost to the Equator, thence northward to Hawaii, and westward toward Japan.

GEOGRAPHICAL AWARD GOES TO LOUISE BOYD

*American Society Honors Woman
for Her Research in Arctic*

Dec. 4

The Cullum Gold Medal for 1938 of the American Geographical Society has been awarded to Miss Louise A. Boyd, explorer and geographer, in recognition of her achievement in Arctic geographical research, it was announced yesterday. Miss Boyd returned on Nov. 30 from her sixth expedition to the Arctic.

Roland L. Redmond, president of the society, said Miss Boyd was the second woman to receive one of the society's awards in the eighty-six years it has been in existence. He also announced that the Charles P. Daly Gold Medal for 1938 had been awarded to Dr. Alexander Forbes, Professor of Physiology at the Harvard Medical School. Dr. Forbes has been in charge of several geographical surveys in Northern Labrador.

The society's announcement stated that Miss Boyd was the "only woman to achieve an outstanding position in Arctic exploration." Last Summer she penetrated Greenland waters to a point farther north than had been reached by ship by any other American and to within thirty miles of the latitude reached by the Duc d'Orleans in 1905.

The presentation of both medals were made at a meeting of the fellows of the society on Dec. 20 at the American Museum of Natural History.

WOLVES ATTACK DOG TEAM

*Bring Indians in Yukon to Near
Starvation*

WHITEHORSE, Y. T. (Canadian Press).—Great packs of wolves and coyotes, so bold they have attacked at least one dog team, were blamed for the near-starvation of sixty Indians at Aishihik Lake.

Members of a party who flew supplies sixty miles northwest of here to the Indians, said an increasing number of wolves and coyotes were killing the moose and caribou on which the Indians normally live. In addition, the supply of fur-bearing animals is being killed off by the marauders, reducing the Indians' revenue from fur sales.

An Indian reported his dog team was attacked by wolves recently, and that he had to shoot several of the animals to save his dogs.

WINDS DIRECT ESKIMOS

*Prevailing Northeasters Keep
Natives From Getting Lost*

BARROW, Alaska (AP).—Eskimos hunting on the ice pack off shore do not get lost when storms arise, despite the absence of landmarks. "There's nothing mysterious about it," Master Sergeant Stanley R. Morgan, hero several years ago of the Post-Rogers tragedy, explains.

"The prevailing winds in this area are northeast and southwest at all times of the year. Hence the Eskimo merely looks at the drift of the snow on the ice, or tosses some in the air and learns the direction."

Arctic Exposition Planned

LONDON.—An International Exhibition of Polar Exploration to be held in Bergen, Norway, in 1940, explains the visit here of Professor Brogger of the University of Oslo. He is engaged in enlisting British support for an exposition that is to present a wide survey of Polar exploration, Arctic conditions, resources, and physical features by means of specimens from the work of meteorological stations, navigational charts, photographs, dioramas, paintings, models, and natural-history exhibits.

King Haakon of Norway is patron of the enterprise, Crown Prince Olav is Honorary President; Johan Nygaardsvold, Norwegian Prime Minister, is one of the Presidents and many survivors of Polar expeditions are serving on the Honorary Committee that was formed in 1936.

There are to be three sections to the Exhibition, and collectively they will relate to a most comprehensive field—the Arctic Ocean, Asiatic and American mainlands adjoining the Arctic Ocean, the Arctic archipelagos of Asia and America, Greenland, Jan Mayen, Spitzbergen, Franz Josef Land, and Novaya Zemlya.

ing—the reindeer's fur makes an exceptionally warm garment—the Siberian cousins of America's own caribou are enabling the Eskimos to leave caribou, rabbits, ducks, geese and other game alone.

Cooperative driving of young ducks and geese, particularly, takes a large toll. In many districts in Arctic America caribou have become almost extinct. Reindeer-herding, only a few years old in Canada, has been practiced in Alaska for nearly five decades.

Polar Areas Invite Dispute For Airbase and Mine Future

WASHINGTON, Feb. 21 (AP)—Diplomatic controversy is in the making over claims staked by this and other countries on frozen lands at the opposite ends of the earth.

One involves a potential airbase in the Arctic Ocean—Wrangel Island, northwest of Alaska.

The other is a slice of ice-capped Antarctica—where geologists speculate on the possibilities of reserves of coal and other minerals.

Congress has a bill to establish a naval air base on Wrangel Island. Its proponents say that a base there, when combined with those proposed for islands in the extreme North Pacific, would give Alaska complete air protection.

Senator Reynolds (D-North Carolina) and Representative Maas (R-Minnesota), authors of the bill, admit there is dispute over possession of Wrangel Island, but assert that the title belongs to this country. Diplomatic sources explain that Russia and the United States are

the major contending powers, England having withdrawn a previous claim.

The question of ownership of ice-covered lands around the South Pole concerns at least six interested nations, including the United States. The others are Great Britain, Australia, Norway, France and New Zealand.

Most recent American claims are based on discoveries by Admiral Richard Byrd between 1933 and 1935, and by Lincoln Ellsworth last year.

The latest conflict of claims—involving about 400,000 square miles—has risen between Lincoln Ellsworth and the Commonwealth of Australia over territory Ellsworth discovered last year. The Commonwealth of Australia is claiming the largest share of Antarctica land. Great Britain claims a part.

The French claim the so-called Adelie Land, in the vicinity of longitude 140, east, including the sector stretching from the continental coast to the Pole.

Ellsworth will continue on the staff as scientific director.

The appointment of Mr. Washburn brings to the museum's staff a scientist whose exploits have won international recognition. His expeditions have been under the auspices of the National Geographic Society, Geological Society of America, the New England Museum of Natural History, Harvard University and Dartmouth College.

Mr. Washburn is a graduate of Groton School and Harvard University. He began his career while he was a Groton student.

DAUGHTER OF PEARY RECALLS POLAR TRIP

Discoverer's Battle With Snow and Ice Is Recounted

The harrowing experiences of even the most routine voyages into the Arctic at the turn of the century were recounted Feb. 6 to members of the American Polar Society at its fourth annual meeting in Roosevelt Memorial Hall of the Museum of Natural History. The speaker was Mrs. Marie Ahnighito Peary Stafford, daughter of the discoverer of the North Pole.

Mrs. Stafford told how she chris-

tened the meteorite Ahnighito, one of the world's largest, which now reposes in the museum, when she was 3 years old. She told of the ship, heeled over in ice packs; of an eight-hour shore stay in a blinding snowstorm, of hardships and privation and the task of loading the meteorite aboard ship, a job which rivaled the removal of an obelisk from Egypt.

Other famed polar explorers were present, including several members of the Byrd expeditions to both poles. Admiral Byrd, recently elected to honorary membership, sent a formal letter of acceptance.

It was announced that all officers of the society had been re-elected for the coming year. They include Paul Siple of the Byrd Antarctic Expeditions, president; Russel J. Walrath and Lieutenant Carl O. Petersen, vice presidents; August Horowitz, secretary, and W. E. Byrne, treasurer.

A GHOST SHIP OF THE ARCTIC

By C. H. CALHOUN

CRISTOBAL, C. Z.

ABANDONED on the mud flats of Cristobal Harbor, one of the most famous ships of the whole chapter of Arctic exploration is slowly rotting away under the tropic sun. It is the Roosevelt, in which Admiral Robert E. Peary fought his way north through the ice on his discovery trip to the North Pole in 1909.

The vessel, which has lain here in the mouth of the old French Canal for nearly two years, was regarded as only another abandoned tug until recently. Then Mrs. Marie A. Peary Stafford, Peary's daughter, who once was known to the world as "Snow Baby," inquired about it, saying that it was her father's old ship and that she had hopes of salvaging it.

An investigation by J. G. Moyer, captain of the port of Cristobal, ended any doubt that this was the original Roosevelt of Peary's expedition. He found the vessel in poor condition, however, resting in thirty feet of mud and water. It would require about \$10,000 to raise it, dock it and make it seaworthy. The engines and equipment probably would have to be replaced. And the Panama Canal has claims amounting to about \$2,000 against it. Towage to New York would cost another \$10,000. All in all, Captain Moyer indicated that it might cost as much to recondition the old vessel as she cost in the first place.

Whatever the outlook for the Roosevelt, her past was brilliant, at least for a time. She was built, under Admiral Peary's supervision, at Buckport, Me. A hundred and sixty-six feet long at the waterline, she had a registered

gross tonnage of 614 and was soundly reinforced to cope with heavy ice. She was named for President Theodore Roosevelt.

Peary used the ship for his successful trip northward in 1909 and she did all he had expected of her in the ice. On the return voyage her rudder was smashed and her propeller damaged in the ice and her captain, Bob Bartlett, daringly beached her stern first on an isolated shore, made emergency repairs and brought her and the triumphant Peary home safely. After her Arctic career she was acquired by the United States Bureau of Fisheries.

EVENTUALLY, however, she went on the block and became the property of a Puget Sound tug and barge company. Her ice work was done. Now her heavy engines throbbed to the load of lumber barges and she worked south, tugging cargoes through the Panama Canal and up the East Coast. And to ignominy was added disaster.

The first serious trouble came early in 1926 when the Roosevelt, towing two big bargeloads of lumber from Seattle, lost her rudder. She drifted for days, helpless, before help came and she was towed into Balboa, where repairs were made.

Nearly eleven years later the Roosevelt sailed from Cristobal for New York with the barge Jason in tow. It was the day before Christmas in 1936. Less than half a day out she had to return because of serious leakage. Repairs were made and on Jan. 8, 1937, she again put out. And again trouble developed. Nine days later she was back in Cristobal, in the tow of a Panama Canal tug. Thereafter she lay abandoned in the mud.

MEAT RELIC CENTURY OLD

Veal Canned for Arctic on View in London

The authentic date of the first canned meat has been put at least thirty years back by the contents of a glass tube placed on exhibition in the museum of the Royal United Service Institution in Whitehall, London. It contains veal roasted over a century ago. The tin from which the meat was taken is also on exhibition with the intaglio inscription: "Cut round with chisel and hammer."

The tin is the earliest known example of canned food, and is one of the exhibits at the museum connected with polar exploration. It formed part of the stores taken by Sir William Parry on his expedition to the Arctic in 1824 and brought back unused.

Although a Frenchman invented the process of canning at the end of the eighteenth century, it was left to the English firm of Donkin & Hall to make practical use of his discovery. The firm set up business in 1811, and two years later their products were being used by the navy and army.

It is reported that the Duke of Wellington, then Lord Wellesley, tried and approved of their preserved beef, and in 1814 Sir Joseph Banks, then president of the Royal Society, wrote in praise of the nutritious qualities of what he termed "your embalmed provisions."

Bradford Washburn Gets Museum Post in Boston

Named Executive Director of Natural History Institution

BOSTON, Feb. 26.—Appointment of Bradford Washburn, of Cambridge, geographer, explorer and mountain climber, as executive director of the New England Museum of Natural History, was announced today by John K. Howard, president of the museum's board of trustees. Mr. Washburn will assume his duties immediately. Dr. Edward Wig-

ESKIMOS SEND MORE MAIL

They Use Own Syllabarium in Canadian Communications

OTTAWA, Dec. 17 (Canadian Press).—Canada's Eskimo population is making increasing use of the mails, according to officials of the Eastern Arctic Patrol, under the administration of the Department of Mines and Resources.

Letters and messages between widely separated Eskimo families now form a considerable part of the mail carried by the mailship Nascope in its annual cruise in the Eastern Arctic.

Most of the correspondence among the Eskimos is carried on in the syllabarium which makes use of some sixty phonetic characters and is more adaptable to the Eskimo language than the English alphabet.

The Eastern Arctic natives are proud of their ability to write the syllabarium and eager to use the postal facilities to communicate with their relatives and friends.

PRIEST GETS AIR ALTAR

Father Schulte Is Having Plane Rebuilt for Arctic Use

EAST ST. LOUIS, Ill. (AP).—A "flying chapel" is under construction here for use of the famous missionary, the Rev. Father Paul Schulte in the Arctic regions.

An amphibian plane, once owned by Gar Wood, the international motorboat racer and designer, is being converted into the air-altar by workmen at Parks Air College.

"STARS AND STRIPES NAILED TO THE POLE"

By DONALD B. MacMILLAN

Member of the Peary Polar Expedition

THIRTY years ago next Thursday, on April 6, 1909, a group of six men—four Eskimos, one Negro and Commander Robert E. Peary, discoverer of the North Pole—stood as near as men could get to that geographical pinpoint in the center of more than a million square miles of drift ice and raised the American flag, bringing to a climax three centuries of effort to break down the barriers of the Arctic.

Many years had gone by since Peary as a young lieutenant in the United States Navy stepped from the deck of the *Eagle* onto the shores of Greenland. That was in 1886. He had read of the loss of ship after ship, crushed in the relentless jaws of the polar pack, and wondered why ships could not be built to withstand the pressure. He had read of the loss of Sir John Franklin and his 129 men—the story of their falling on their faces and dying as they walked, as told by an old Eskimo woman. He had read of the starvation of De Long and his men on the northern shores of Siberia, of the terrible suffering of Greely and his men on the bleak shores of Cape Sabine. He wondered if all could have been avoided. He was here in the Northland to see and learn for himself.

A few weeks later Peary and a Dane named Malmgaard were plodding on and up over the great icecap of Greenland. The Gods of the North, better known to the Eskimos and the explorers as the Evil Spirits, were amazed. Ever jealous of their secrets, they struck. Peary and his companion, in their vain attempts to protect themselves from icy blasts, huddled with their backs against their sledges. The snow drifted over them. But Peary found what he had looked for—or thought he had—a new highway to the Pole. A level white road leading northward.

The young naval officer returned home enthusiastic over his plans for an extensive survey of the interior of this 500,000 square miles of ice lying on the back of Greenland. He took up his duties in the navy and awaited impatiently the day when he could again set his face northward. In 1891 he went again to North Greenland and, although he had broken his leg on the ship, he pushed on some 600 miles to the north on the icecap edge, where he made his camp. In 1894 he resumed the attack, and again in 1895, always learning more of the methods of living and traveling in the North, adopting native ways, learning how to avoid scurvy and to use dogs for transportation.

ON that 1895 trip, when Peary and his two companions, Matthew Henson, his

Negro follower, and Hugh Lee, disappeared over the great white dome of ice with wholly inadequate equipment, the Evil Spirits of the North must have laughed aloud. To defeat such men one breath of this cold air at 60 or 70 below zero would be sufficient. One yawning crack in the glacier, a smothering drift, illness of one of the men, disease among Peary's dogs—any one of these forces could defeat the men from the South. But Peary proved that all of these evil forces together could not stop him.

The reader of Arctic history looks with admiration into that tent on the Greenland icecap 500 miles from his base. Dogs had gone to the dogs literally and figuratively. Only eleven remained out of forty-two, and of these eleven three were scarcely able to walk. By eating dogs and the remainder of their food the men might possibly reach home. If they went on and failed to find musk oxen in the land beyond the icecap, then silence. The world would never know their fate. They talked it over. They decided to go on.

Weeks later the three men returned to their base. Their eyes were inflamed, their faces spotted with frozen black patches. Their food was gone. Peary walked alone, followed by the one remaining dog. Far in the rear came Henson, walking very slowly. Far behind him little Lee staggered along. They slept again in their hut at the edge of the sea. They were back in spite of wind and cold and drift and dropping dogs; they had done it. And Peary was already planning another trip. He knew then that he must establish his base nearer the Pole.

In 1898 he forced his ship through the ice of Smith Sound into the Kane Basin. From there, contrary to all Arctic precedent, he dared to harness his dogs, leave his ship and sledge northward in the middle of the big Arctic night. With the thermometer at 50 or 60 below zero, he groped his way along the eastern shores of Ellesmere Land, around Cape Baird, and into Lady Franklin Bay, searching for the headquarters of the Greely expedition, abandoned sixteen years before.

He stumbled through the door with both feet frozen to the ankles. Toe after toe sloughed off. Finally he was lashed to a sledge and carried through the broken ice of bays and inlets and along the ice foot back to his ship, 200 miles to the south. Crippled? Within thirty-seven days, following the final amputation, he was headed north again. Four years he remained in the north, and returned scarred

and temporarily beaten, but with a knowledge of why he was beaten—the secret of his final success.

WHAT manner of man was this who had such control of the natives of the Far North that he could induce them to struggle over the surface of the great Sermiksuah, the abode of the Evil Spirits; to leave their homes in Smith Sound and travel 700 miles due north; to drive their dogs over grinding masses of drift ice with nothing as their objective?

What was the secret of his power over the white men of his party, who were willing to follow him to the end of the world, until every ounce of food was gone, and the last dog eaten?

The answer is found in a study of his reply to Theodore Roosevelt upon the presentation of the Hubbard Medal of the National Geographic Society in 1906: "The true explorer does his work not for any hopes of reward or honor, but because the thing which he has set himself to do is part of his being and must be accomplished for the sake of its accomplishment."

"To me the final and complete solution of the polar mystery, which has engaged the best thought and interests of some of the best men of the most vigorous and enlightened nations of the world for more than three centuries, and which today stirs the heart of every man or woman whose veins hold red blood, is the thing which should be done for the honor and credit of this country, the thing which it is intended that I should do, and the thing that I must do."

No more complete reason for men's polar exploration has ever been given. Here we have the qualities of a great leader: devotion to an ideal, singleness of purpose, determination, energy and love of country. Peary was ready to give his life if necessary; we who admired him were willing to follow him.

This admiration for the man and what he had thus far done resulted in the building of the Roosevelt, one of the strongest ships ever constructed to withstand the Arctic ice. With engines throbbing under high pressure and smoke belching from her funnel, Peary and Bob Bartlett, her captain, fairly hurled the ship into her Winter quarters at Cape Sheridan, on the northern shores of Grant Land, 430 miles from the Pole. The Roosevelt had done what she was intended to do; she had justified her existence.

BUT another attempt at the Pole failed.

A blizzard obliterated the trail, smashed up the ice, scattered and destroyed caches of food and drove men, dogs and sledges sixty miles to the east. The various supporting parties struggled shoreward, but not Peary and his men. Knowing that no relief could be expected from the rear, that all food supplies were gone, that they must depend entirely upon the food of their sledges, they turned their backs on home and plodded on to a new record of "Farthest North," a distance of only 174 miles from the Pole.

Weeks later that tired little band of men climbed feebly up over the ice foot of Greenland, burned their last sledge for fuel, ate one of their three dogs and began their long walk back to the ship. When Peary arrived in America he said he would make another and last attempt.

What young man with red blood would not follow such a man and spend every ounce of his energy to help place him at the goal of his ambition? Not one of us who signed his contract at the old Grand Union Hotel in New York City expected to go to the Pole; not a man went north for that purpose. Each wanted to do his little, and that little his best, to place Peary at the Pole. I write this in answer to the oft-repeated statement that Peary's men were very much disappointed at not being permitted to accompany their commander to his last camp.

We entered upon this last enterprise with no misunderstanding. We knew what we were facing, for we had followed him for years. We knew that this was probably his last attempt, and that he might go beyond the limit of safety, but, if so, then we all wanted to be with him and were eager for the start. We had absolute faith in Peary, a man thoroughly versed in ice technique—a master of his profession.

That he took Matt Henson on his last dash was very natural. Henson was indispensable to Peary. With eighteen years of experience equal to that of Peary himself, an expert dog driver, a master mechanic, physically strong, most popular with the Eskimos and speaking their language perfectly, full of grit, he went on with Peary because he was the most efficient of all Peary's assistants, white or Eskimo.

THE Roosevelt again fought her way northward and succeeded in reaching Cape Sheridan, 82 degrees 30 minutes north latitude, where she was frozen in for 315 days. All Winter men sledged out into the darkness and cold and blizzards, seeking game for food and learning much of the country. Everybody worked all the time; it was good for us. We got hard and fit, and so did the dogs. Plans for the polar journey were worked out.

To feed Peary and his men until he was within striking distance of the Pole, and to keep men alive on the way back, was the work assigned to the so-called supporting parties under the command of George Borup, Bob Bartlett, Dr. J. W. Goodsell, Ross G. Marvin and myself.

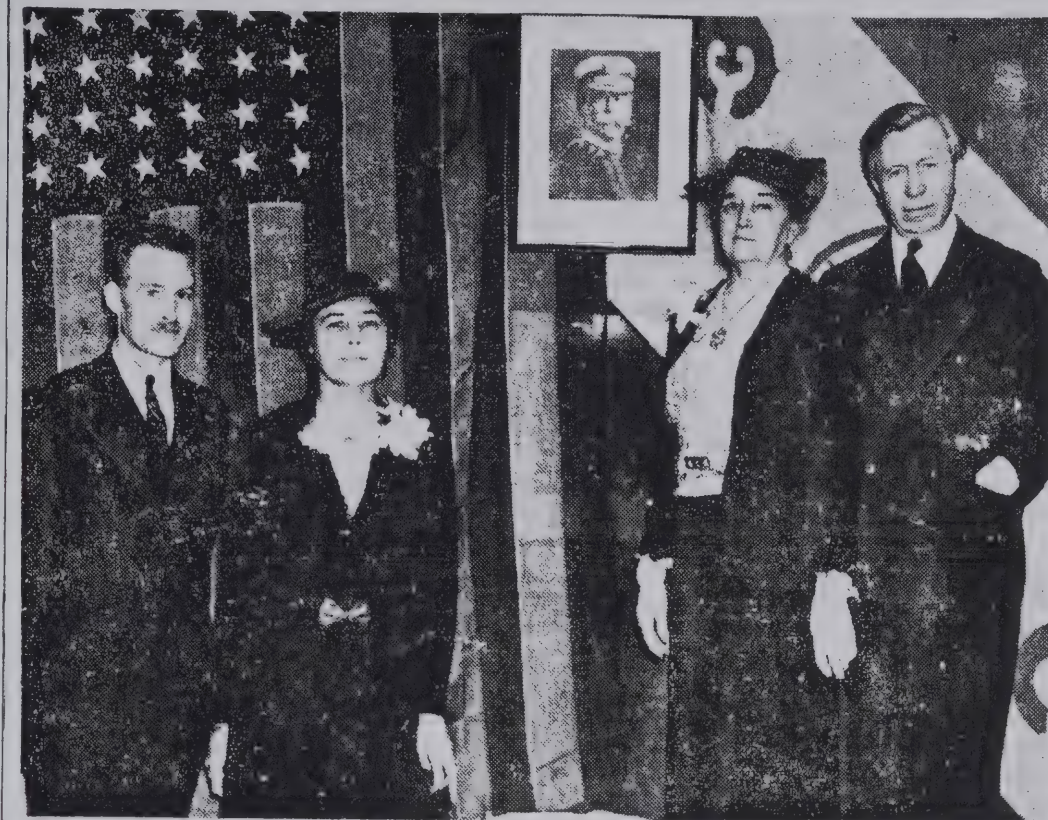
Every five days one of these leaders was to return to land from the drifting polar ice, leaving part of his food supply with those who were to go on farther. Only in this way could the members of the final party be assured of enough food to last them to the Pole and return. Those who went back were ordered to double march, and, if held up by open water, to eat the dogs. The last ounce of food might mean the last mile.

The American people, in general, have no conception of the dangers of travel on the polar sea, and have overestimated the narrow margin of safety of even a small party 500 miles from land. The presence of one man not absolutely needed in the work endangers the lives of all, for that man must be fed and must receive an equal amount of the last bite. It was Peary's fight, not ours; ours only just as long as we were needed.

IN the dawn of the Arctic day, taking advantage of the few hours of twilight, men and dogs were away along the white trail leading to Cape Columbia, the most northerly point of all North American land, 413 miles from the Pole. There we gathered in a snowhouse to receive our last instructions. We were a serious five men as we gathered in the igloo late that evening, not because of impending hard work, extreme cold, frozen hands, faces or feet, or of open leads, thin ice, easterly drift, or a multitude of other things, but because each one of us realized that he was a link in the chain, a link upon which Commander Peary depended.

On Feb. 28, 1909, a clear, cloudless Sunday, with a temperature of 50 below zero, the Borup and Bartlett units started for the polar sea. Some changes had to be made because two Eskimos were out of the game and six dogs had died. So Borup accompanied Bartlett for a way. No water could be seen. Everything appeared favorable. The next day the whole expedition, twenty-four men, nineteen sledges, and 133 dogs, was on the move following the winding trail.

There was a vicious wind and snowdrift, but we were used to that. The rough ice took its toll in smashed sleds. It was so cold



Times Wide World

EXPLORERS CLUB HONORS DISCOVERER OF THE NORTH POLE

Robert E. Peary Jr., Marie Peary Stafford, Mrs. Robert E. Peary and Vilhjalmur Stefansson, president of the club, at exercises at which a portrait of Rear Admiral Robert E. Peary was unveiled.

alcohol would not burn; there was no vaporization. The Eskimos were worried. Peary tore up paper and lighted it, and the heat of the burning paper raised the temperature of the alcohol so that it would burn and we could make our tea. In addition to hot tea, Peary's rations consisted of two things: eight ounces of frozen pemmican and eight ounces of biscuit, all that was really necessary for hard work in the Arctic.

In one other particular the Peary expedition differed from all others. Peary permitted no man to take anything to put over himself at night—no blankets, no sleeping bags. So far as I know, this is the only Arctic expedition that slept without covers of any kind in temperatures of 50 and even 60 below zero. Peary reasoned that if northern animals, such as the polar bear, caribou and hare slept in the snow, we could; therefore we did, since we were clothed in skins of these very animals.

We sighted a lead, crossed thin ice on the run, a wave of ice attending every sledge, the sheet so elastic that it seemed like rubber. We hit the big lead, were held up there for six days, while the Eskimos got jumpy and Peary paced back and forth, looking north and south, ahead to his objective, back to his supporting

teams. Finally we went on, leaving a note to Marvin saying that our fuel was low and that he must catch up with us. We pushed on at a feverish speed.

WE got into camp at night, our underclothes wet with perspiration. It was hard, killing work. I should like to say we liked it, but we didn't. We were frostbitten. There were black patches on every face. The rims of our ears were black, where in desperation, despite the cold, we had shoved back our hoods to cool our sweating necks and heads. The tips of our fingers were horny, cracked and bleeding. The working coat of each man was a mass of ice about the face and around the bottom. To get out of that sodden, half-frozen garment and stand for a moment exposed to a wind at 50 below zero while putting on a dry deer-skin coat for sleeping was heavenly compared to the trying job in the morning of pulling the warm coat off and exchanging it for a mass of ice, snow and wool, which absolutely refused to open or to conform to the shape of the day before.

But we went on. On March 15 I started back. Borup turned back from 85 degrees 23 minutes north; Marvin from 86 degrees 38 minutes, and Bartlett

from 87 degrees 47 minutes, a distance of only 133 miles from the Pole. Borup and Bartlett got back safe. Ross Marvin was drowned in attempting to cross over the thin ice of a lead.

Peary said good-bye to Bartlett, and with Henson and his four Eskimos kept on. On April 5 an observation placed him at 89 degrees 25 minutes north, thirty-five miles from the Pole. The going was better. At 10 o'clock on April 6 an observation placed him at only three miles from the Pole. He went on for ten miles and an observation placed him beyond the Pole. He returned and found himself to the west of the Pole. He walked about and took many observations and raised the American flag.

On Sept. 6, 1909, a wireless message came out of the north—"Stars and Stripes nailed to the Pole." Peary had done what man had tried to do for more than three centuries, what he had tried to do for more than twenty years. And he learned much for the world. There was no land at the Pole; no shallow polar sea but one which he could not sound with 9,000 feet of lead line; no open polar sea, but one filled with ice. He had answered these questions and contributed to the world's knowledge. We all owe a debt to Robert E. Peary.

NAVIGATION NEAR THE POLE

By HEBER D. CURTIS

ONE of the first things taught the student in descriptive astronomy, as he endeavors to master the various systems of astronomical and geographical co-ordinates, is the uniqueness of the conditions that obtain for the astronomer or the navigator at the actual pole of rotation of the earth. The student learns that every direction is south for an observer at the North Pole, that his familiar meridian plane of lower latitudes has vanished, and with it all hour angles and azimuths in their ordinary sense, so that the time of an observation means next to nothing and the observer is in all longitudes at the same moment. North, east, and west have vanished; the stars describe circles parallel to the horizon on the celestial sphere, and so also the sun and the moon if their motions in declination are not taken into account. If the observer is as much as a mile or so from the pole, a short walk may take him from west into east longitude across the international date line of the 180th meridian and into another astronomical day.

Perhaps in part a result of such well-known items of our apparatus of instruction, there is the widespread impression that navigation or the determination of one's geographical position in the immediate vicinity of the poles of the earth is a process of mystery and high uncertainty, involving the use of complex and special methods of observation and calculation.

Nothing could well be farther from the truth. As a matter of fact, the determination of the co-ordinates of a station located within a radius of 10 miles from the pole uses essentially the same methods and is just as simple as it would be for a similar area near the equator. It is true that on the journey "up" to such a polar camp some special methods may be of occasional advantage and much assistance may be derived from such modern adjuncts as the radio time signal and the sun compass in steering on a true north course. Once arrived at the camp close to the pole, however, there is nothing new or strange; probably we shall find that we have had much more trouble at 80° N. than awaits us at 89°-55' N., for certain simplifications will be found near the pole. Time and longitude both become uncertain so that an accurate value of the time of an observation is no longer essential; our watches may be 10 to 20 minutes in error without noticeable effect. If actually at the pole, moreover, the zenith coincides with the pole of the heavens so that the simple processes of addition and subtraction take the place of the spherical trigo-

nometry of lower latitudes. Our instrument is the familiar sextant and the mercury surface of the artificial horizon; our methods of calculation and planning of the observations will be essentially identical with those used by any navigator or any astronomer were he set down at some place in sunnier latitudes.

The success of the soviet aviators in establishing a semi-permanent camp on the ice floes in the immediate vicinity of the North Pole has aroused considerable popular interest in the question of navigational methods near the earth's pole of rotation. In addition, there has recently been published by Professor William H. Hobbs an interesting and inspiring biography of Peary in which he touches on the methods used and on what has been fittingly termed "The Great Controversy," that raged between the supporters of Admiral Peary and Dr. Frederick A. Cook with regard to the discovery of the North Pole (Peary, by William H. Hobbs, Macmillan, 1936).

It is no part of the present article to discuss the bitterness of the Peary-Cook controversy as manifested in the United States, which finally attained a quasi-political importance through the fact that several Congressmen (naturally authorities on navigational problems!) were strong partisans of Cook. Action was accordingly delayed on a first report on Peary's records prepared by a strong committee of experts. Later, Peary's data were checked by Messrs. H. C. Mitchell and C. R. Duvall, of the U. S. Coast and Geodetic Survey; their report was finally accepted, while Dr. Cook's claims were decisively rejected by the University of Copenhagen. Even yet, however, 30 years after the event, occasional reverberations of the old controversy will be heard, and a statement will appear in the daily press to the effect that Peary never reached the pole.

Peary's data as worked up by Messrs. Mitchell and Duvall with recomputation of the refractions, etc., appeared in a note by Thomas C. Hubbard, "To Students of Arctic Exploration," in *Atti del X Congresso Internazionale di Geografia*, Rome, 1913, but has been reprinted in part by Professor Hobbs as Appendix C to his biography of Peary where they are more accessible to the general reader. The full calculations were also reprinted and distributed by the National Geographic Society in 1927.

In these sources will be found the check computations for Peary's observations of April 7, 1909 (to be referred to later as

Shots 3 and 4). The position of Camp Jesup was determined by Messrs. Mitchell and Duvall in the Rome paper from Shots 3 and 4 by two independent methods of computation. Mitchell's computation reached the result without an explicitly assumed position for Camp Jesup; Duvall, using a trial and error method, had to assume a starting latitude.

Because of the fact that the adopted zenith was less than 5' from the pole, the resulting triangles—pole-zenith-sun—were so "extreme" that 7-place logarithms were necessary in the solutions. No fault can be found with this procedure *per se*, but it is rather unfortunate that in the reproduction of these calculations the value of the latitude was not then rounded off to minutes or tenths of a minute of arc at most, instead of being given to hundredths of a second of arc—about 1 foot.

This point has been criticized in the review of Professor Hobbs's book published in the *Geographical Journal*, 89, 255 (1937). As is customary in reviews, this is signed only with the initials, A. R. H. and J. M. W. Inasmuch, however, as these initials so evidently stand for A. R. Hinks, Secretary and Editor of the R. G. S. and for J. M. Wordie, Honorary Secretary of the R. G. S., this review will be referred to, when necessary, under the names of Hinks and Wordie. In their criticism of this point, these reviewers appear to have overlooked a sentence in the original Rome paper (p. 707): "The geographic position given for Camp Jesup, namely: Lat. = 89°-55'4 N.; Long. = 137° W., is the best obtainable value for the position of that point." The writer feels that some other features of this review are "uneven" in the selection of material for criticism almost to the point of unfairness. An answer to this review was published by Mitchell and Duvall in the same *Journal*, 90, 164 (1937), with a reply by the original reviewers, *ibid.*, 167.

Peary's own descriptions of his methods of taking his astronomical observations near the pole, precautions necessary, the succession of observations taken and the reasons therefor, have been taken, by preference, from Peary's earliest detailed description of his polar journey given in a series of ten serial articles in *Hampton's Magazine* (no longer published), vols. 24 and 25, between January and September, 1910, under the title "The Discovery of the North Pole," about 145 pages plus 124 half tones and 3 maps.

The uniqueness of the actual pole as a site for astronomical observations has been mentioned in the first paragraph and is so

well known as to need no further emphasis. But the moment our site is moved a few miles from the pole in any direction, other factors begin to enter, though their effects are relatively small. We now have a meridian, hour angles, longitude, and time, though all of these are somewhat indeterminate in numerical value. Furthermore, queer pranks are played upon us through this proximity to the pole. We may think, as did Peary, that we are taking an observation approximately at apparent noon, while it is in reality 6:00 A.M. at our place of observation! Does this affect our results materially? While we feel sure in advance that earlier results cannot be materially changed, no one, to the best of the writer's knowledge, has ever worked over Peary's results with these points in mind, and no better way can be found to accentuate the peculiarities in the determination of a position close to the pole than to review Peary's actual observations in some detail. We shall then arrange the discussion in approximately the following order: (1) a very brief description of

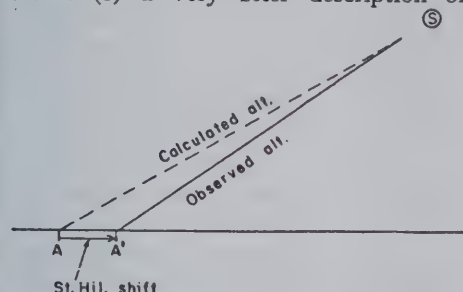


FIG. 1.—THE SAINT-HILAIRE METHOD—ELEVATION

the navigational method effectively¹ employed by Peary, the only one really usable under the conditions; (2) a discussion of the actual observations with a search for possible omissions in data or treatment; (3) a re-reduction of the observations that shall include the aforementioned peculiar features of work close to the pole. Finally, we shall ask ourselves the questions, could Peary have done

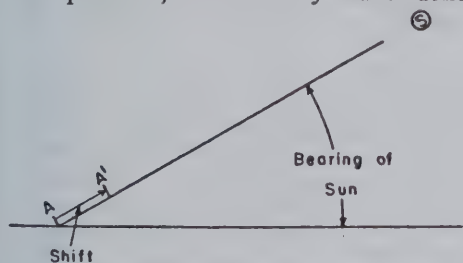


FIG. 2.—THE SAINT-HILAIRE METHOD—PLAN

better in 1909, and could we do better in 1939? Our review of Peary's observations, as will be seen later, may then be described as in the nature of a second approxima-

¹ Effectively, as shown by his use of the observations, though Peary does not explicitly use the words "shift" or "Saint-Hilaire" in the popular account in *Hampton's Magazine*. He found his "latitudes" referred to the pole as origin; the differences from 90° then motivated the two sledge trips to be mentioned later.

tion, from the standpoint of the astronomer and the modern navigator.

The Saint-Hilaire method.—The Sumner method, in its original form, has been almost completely supplanted in modern navigation by the later modification known as the Saint-Hilaire method, discovered by the French Captain Marcq Saint-Hilaire in 1874 and first published in *La Revue Maritime et Coloniale* in 1875. The principle of this beautiful and efficient modification is shown with sufficient clearness in the two small diagrams, Figs. 1 and 2, inserted solely for the student who may be unfamiliar with the method; Fig. 1 shows the method in elevation, while Fig. 2 shows it in plan.

We have reason to think, or we assume, that we are at a certain station *A* on the earth's surface, assumed to be a plane for the relatively short distances involved. Knowing the assumed co-ordinates of *A* and the local time, it is a simple matter to calculate what the altitude of the sun or star should be, shown by the dotted line, if we are where we think we are. An observation, however, indicates that the celestial body is really at a different altitude, shown by the full line. We must then "move" our assumed site to the location where we would have the observed altitude; in the figure, the observed altitude is the greater so that we must move toward the sun, to the point *A'*. Figure 2 indicates this same Saint-Hilaire shift as seen from above, and the shift must naturally be along the line of the bearing of the sun, to the point *A'*. If we are able to take but the single altitude, this concludes our work, and we adopt *A'* as the corrected position. The most probable position of the site is somewhere along the Sumner line, a short line drawn through the new position at right angles to the bearing of the sun. If we can take altitudes of two bodies, however, or of the same body at considerably different hour angles, the position will be much more accurate, for it should be at the intersection of the two resulting Sumner lines, which we term a "fix." Any location not too far away may be taken as our assumed position; in fact in some of the modifications of the Saint-Hilaire solution subsequently made by Aquino, Dreisonstok, and others, it has been customary to take one co-ordinate of the assumed or dead-reckoning position in half or whole degrees so as to avoid troublesome interpolations in the condensed tables that are employed. Peary, in effect, used this method at the pole, and assumed the pole as his dead-reckoning site; we shall simply choose another site as a second approximation which will be closer to the actual site and which will be a small distance from the pole so as to permit the inclusion of approximate values of the actual time

at the site. While, as already noted, we do not expect to secure a radically different value for the co-ordinates of his polar camp, it will serve to emphasize certain peculiar features of astronomy close to the pole.

Peary's observations at the pole.—There cannot be the shadow of a doubt from Peary's observations near the pole that at about 10:00 A.M. (60th meridian time) on April 6, 1909, he reached his final camp, called Camp Jesup, and that this camp was less than 5 miles from the true pole. There is no space in this note for a description of the consummate generalship of the pioneer parties sent ahead to break the trail and successively sent back when no longer needed, a plan through which the 413-mile journey was successfully traversed from Cape Columbia on the northern shore of Grant Land (longitude about 70° W.), and doubtless the only plan that could have succeeded in the days before the airplane. Peary's "steering" and "distance" were both remarkably good; we know now that he reached a site "level" with the pole, but about 4 miles "west" of it, so far as the meridian of Cape Columbia was involved.

While near the pole, Peary took 13 altitudes of the sun. His first observation (Shot 1) was interrupted by clouds, so that it consisted of but one altitude of the sun's lower limb; it indicated that Camp Jesup (henceforth frequently abbreviated to *CJ*) was about 3 miles on the "south" or Cape Columbia side of the pole.² Peary's three later observations (Shots 2, 3, and 4) each consisted of 4 altitudes, 2 measured on the upper and 2 on the lower limb of the sun.

Peary knew that to determine the position of *CJ* in both co-ordinates he must secure an observation preferably nearly 90° from the first one; he accordingly prepared to do this 6 hours later, but the sky was cloudy. He then journeyed about 10 miles "north" along the line from Cape Columbia and took Shot 2 at the end of this journey, a site which we shall term *CJ'* (see Fig. 4). This journey, and the subsequent sledge trip "poleward" between Shots 3 and 4, was carried out as follows: A double team of now well-rested dogs was hitched to a sledge whose only actual freight was a single tin of pemmican. With an Eskimo to help over the rougher spots, search for detours around hummocks or rafted ice floes, etc., quite high speed could be attained.

Returning to *CJ* after this sledge trip, he secured Shot 3 in a direction nearly at right angles to that of Shots 1 and 2; he thought this was a 6:00 A.M. shot, and it was such as far as the Cape Columbia meridian was involved, though we shall see later that it was actually midnight and

sub polo in the apparent time at *CJ*. Six hours later he took another set of observations, a duplicate in its essentials of the one made at the beginning. But Shot 3 had indicated that *CJ* was about 4' from the pole in the "direction of Bering Strait" (168° W.). So a second sledge trip of 8 miles "poleward" was carried out between Shots 3 and 4. Four hours later he made the decision to start at once on the hazardous return journey to Cape Columbia.

The principal data with regard to the four sets of observations are assembled in Table 1, with some notes of explanation or amplification.

The conditions attending the four shots made by Peary in the vicinity of the pole are assembled in schematic form in Fig. 4. From the standpoint of the navigator or the astronomer, and bearing in mind the rather extreme field conditions, it must be admitted that Peary's observations leave

a most favorable impression, as they are adequate in plan and of very high rank as regards technical execution. No necessary datum is omitted except the index correction in Shot 2.

Though perhaps superfluous, a rough estimate of the probable accuracy of these observations may be in place. The accumulated errors in a good sextant due to eccentricity, lack of parallelism of mirrors or shade glasses, etc., will rarely exceed 12" = 0.2 mile, and will generally be less. Errors due to anomalies in the refraction cannot be predicted, but are believed to be absent in the observations under consideration.

An aviator may consider himself fortunate if he determines the position of his plane through astronomical methods, with a precision of ± 10 miles; the average rule-of-thumb navigator trusts his ship's position within 5 miles; careful sea navigation, with Sumner fixes, is generally good within 2 miles. By multiplying observations and taking numerous precautions, it is quite possible for a skilled observer to determine the position of a station on

land by means of the sextant and artificial horizon well within a tenth of a mile; this accuracy, however, is not claimed for Peary's four polar shots. Shot 1, a single altitude of the sun's lower limb,

would be admitted to have a possible error of 3 or 4 miles by any practical navigator. The accuracy of Shots 2, 3, and 4, each comprising 2 sights on the upper and 2 on the lower limb of the sun, is consid-

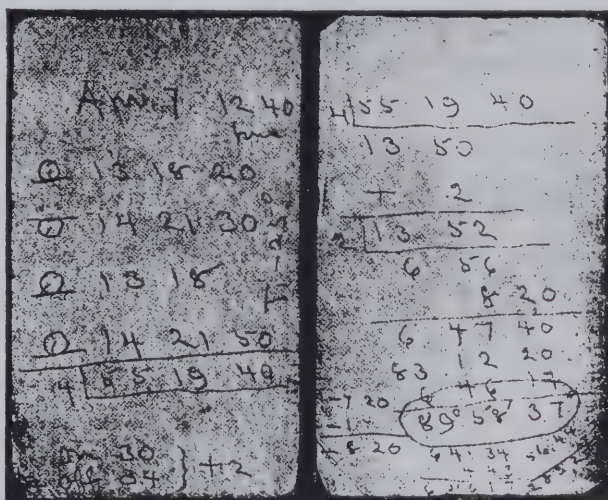


FIG. 3.—PEARY'S RECORD OF SHOT 4, REPRODUCED FROM HAMPTON'S MAGAZINE, 25, 175 (1910)

The original is on thin and worn paper, but the navigator who studies these figures will find a complete and satisfactory record of an observation taken and reduced under extreme field conditions.

The date and the watch time are recorded at the top of the left-hand page, and beneath this come the 4 measured double altitudes, 2 on the upper and 2 on the lower limb of the sun (the final one erroneously recorded as lower instead of upper). Near the bottom of this page we read, "On 30 Off 34," indicating that Peary determined the index correction of his sextant by the approved method of tangency of the two solar images. The difference, 4', is divided by 2 to get the index correction, applied on the next page, and Peary doubtless determined the sign of this correction by the ancient navigational mnemonic couplet:

"When it's on the arc, it's off;
When it's off the arc, it's on."

Broadcast on the margin of the first page is the record of the temperature.

On the right-hand page we find the mean of the observations and the application of the index correction, giving the uncorrected altitude of the sun's center. Beneath are the calculations for the refraction and for the sun's declination, with the final latitude as derived from the calculation.

Messrs. Mitchell and Duvall have called to the writer's attention a trivial error in the multiplication at the lower right-hand corner of the second page. The writer agrees with them in regarding this unimportant slip as an earmark of the stress under which this work was done, and as a further proof of its genuineness, if such were needed.

erably higher; the writer is inclined to attribute to these an internal probable error of only approximately ± 1 mile, for a number of reasons. Peary himself seems unduly modest in his estimate of error, made in *Hampton's Magazine*, 25, 180 (1910):

TABLE 1

| | Shot 1 | Shot 2 | Shot 3 | Shot 4 | Notes |
|--|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-------|
| Observed from | <i>CJ</i> | <i>CJ'</i> | <i>CJ</i> | <i>CJ</i> | 1 |
| Assumed position <i>CJ</i> or <i>CJ'</i> | 160° W 89°-57' N | 127° E 89°-49'6 N | 160° W 89°-57' N | 160° W 89°-57' N | 2 |
| Temp. F. | -11° | -30° | -30° | -25° | 3 |
| Total range | — | 20" | 20" | 30" | 4 |
| Index correction | + 3' | lacking | + 2' | + 2' | 5 |
| Refraction | | re-computed throughout | | | 6 |
| Refraction, lower—upper limbs | | found negligible | | | 7 |
| No. observations | 1 | 4 | 4 | 4 | |
| Peary's watch (10 min. fast on 60th mer. T.) | 1909 April 6, 12h-50m P.M. | 1909, April 7, 12h-40m A.M. | 1909, April 7, 6h-40m A.M. | 1909, April 7, 12h-40m P.M. | |
| Actual app. T. at site, about | 6 A.M. | 1 P.M. | Midn't <i>sub polo</i> | 6 A.M. | 8 |

(1) The adopted dead-reckoning position of *CJ* is 3' from the pole and at right angles to the line from Cape Columbia to the pole.

(2) Position *CJ'* assumes that Peary sledged just 10' between Shots 1 and 2, and in the continuation of the journey line from Cape Columbia.

(3) Peary states that the main difficulty in working with the sextant at these low temperatures came not so much from the cold as from the eyestrain due to the snow glare.

Some special precautions were necessary. The mercury was well warmed in advance in the igloo to prevent freezing. A special wooden trough had been made; this was filled right to the brim with mercury and so blocked up inside the artificial horizon roof that neither the roof frame nor projecting rims of the trough could interfere with the measurement of the sun at these low altitudes, all less than 7°. The observer lay prone on his stomach, with elbows and body resting upon a skin spread on the ice, thus bringing the eye sufficiently low and making it possible to hold the sextant with great steadiness.

(4) These ranges in the individual altitudes of a shot are astonishingly low, considering the difficult field conditions, and are a tribute to Peary's skill with the sextant. It would be very difficult to better these ranges in routine series of sextant observations made with an artificial horizon under much more comfortable conditions as to temperature and posture. Concomitant evidence as to Peary's proficiency with a sextant may be derived from the values of the sun's apparent diameter indicated by the differences between the altitudes of the upper and lower limbs. These are: Shot 2, 32'-38"; Shot 3, 32'-21"; Shot 4, 32'-21". The angular diameter at this date was 32'-00".

(5) Conforming to good astronomical practice, Peary determined the index correction for each set of observations [see Fig. 3, where the "On 30 Off 34" indicates that the index correction was determined through tangencies of the two solar images]. Shot 2 forms an exception, and it is not known why the index correction was omitted here. It is possible that Peary regarded it as unnecessary in finding the approximate position of the purely transient observation site at *CJ'*. This omitted index correction must have been either 3' or 2'; the chance that it was zero or a value different from those just given is too remote for serious consideration by one familiar with sextants.

(6) Peary carried with him the pages of the refraction tables torn from Bowditch; these extend only to -10°F. The refractions were accordingly recomputed for the recorded temperatures by Mitchell and Duvall and have been again checked by the writer.

Anomalies in the refraction are of not infrequent occurrence at such low altitudes and extreme temperatures. However, because deter-

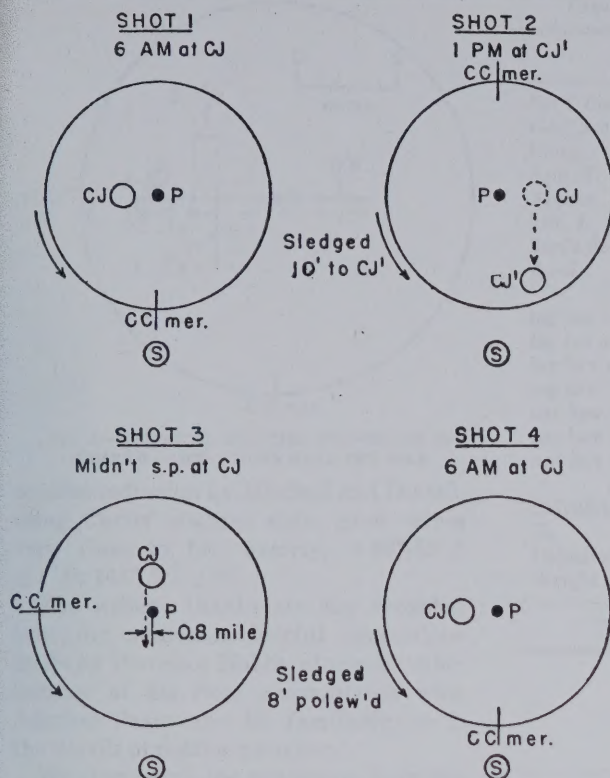


FIG. 4.—DIAGRAM OF PEARY'S FOUR OBSERVATIONS NEAR THE POLE

Showing hour-angle conditions at the sites where observations were made.

"Various authorities will doubtless give different estimates of the probable error in observations made at the pole. I am personally inclined to think that an allowance of 5 miles is an equitable one."

Re-reduction of Peary's observations with "CJ" as origin.—As already noted, this second approximation will use as a dead-reckoning position a point in 160° W. Longitude and $89^\circ-57'$ N. Latitude with the accompanying changed co-ordinates of CJ' instead of the pole; it will include also, as a perhaps unnecessary refinement, the actual apparent times of the observations at the points of observation. There will be no other change in the data as computed

by Mitchell and Duvall and recomputed by the writer, with one exception, an index correction of $+2'$ has been incorporated in the data of Shot 2, making the observed altitude $1'$ greater. The reduction formula employed will be the well-known haversine formula,

$$\text{hav } z = \text{hav } (L-d) + \cos L \cos d \text{ hav } t$$

where z = zenith distance; L = latitude; d = declination; t = hour angle. Many navigators still prefer this formula to the "short-cut" methods devised by Aquino, Dreisonstok, Ageton, and others, which divide the astronomical triangle, pole-zenith-sun, into two right-angled spherical triangles. The reason for the preference lies in the fact that a haversine is always positive, so that there is but one form of solution, and an entire absence of any ambiguity as to algebraic sign, or alternative "cases to remember."

It would be difficult to find four observations where the hour angles and other data are more "extreme" than in Peary's four shots near the pole, yet this universally trustworthy formula handles them in straightforward fashion without the least uncertainty or brain-fag. While 4-place functions would have sufficed, 5 places have been used to be sure of tenths of a mile in the results. In connection with this second approximation, a study of the actual hour-angle conditions at the sites will be of value, as shown in Fig. 4.

Note that the shift for Shot 2, because this shot was taken about 180° from 1 and 4, really indicates a shift away from the Cape Columbia side.

mined at Pulkova, the "low" end of the tables for refraction has been found generally trustworthy, and the complete picture of the polar sights made by Peary indicates that no gross errors entered in from any vagaries of refraction. Any such error seems certainly less than 1 mile.

(7) It is well known that the sun assumes a somewhat oval shape near the horizon; refraction changes so rapidly at very low altitudes that the lower limb is thus raised considerably more than the upper limb. It may occur to the over-captious astronomer, as it did to the writer, that this effect should be taken into account. However, separate calculations of the refraction for the observations on the upper and lower limbs changed the values already found by quantities of the order of 1 second of arc only.

(8) The odd changes between what Peary regarded as his watch times of observations and the actual apparent times at CJ and CJ' , given in the last two rows of entries, may also be seen graphically in Fig. 4.

² As already noted, the dead-reckoning point assumed for the determination of Saint-Hilaire shifts may be arbitrarily assumed without effect on the final results. Peary took the pole for his assumed position, first, because he felt sure it was not far distant, but principally because this assumption relieved him of all computation other than the processes of addition or subtraction.

Accordingly the writer does not understand the statement made by Hinks and Wordie (*loc. cit.*, 256), "He [Hobbs] does not remark that the first single observation gave not a latitude but only a position line; . . ." So far as Shot 1 was involved [and Peary had no other available datum at that time] the shift was about 3 miles toward Cape Columbia and the most probable position of CJ was on the Sumner line about at right angles to the Cape Columbia meridian; this line passed $3'$ "south" (on the Cape Columbia side) of the pole, his assumed dead-reckoning point. He was entirely logical in taking it as a latitude indication; if not a latitude indication in the sense described, one searches in vain for a more suitable name for it.

It seems equally difficult to understand the gratuitous

and apparently unwarranted assumption made by Hinks and Wordie on p. 257, "We conclude that the times attributed to Peary are those at which he intended to take his sights; not those precisely at which he did take them." Though this assumption is softened by the statement in the next sentence that local times close to the pole have little meaning, the writer prefers the simpler assumption that Peary merely looked at his watch and jotted down the time [see the page of his notebook reproduced as Fig. 3]. Peary was a navigator of great experience and skill, and must have known enough of peculiarities of navigation near the pole to realize that this was a sufficient record. Thus the implied criticism of Hinks and Wordie higher on the same page, "The only trouble is that he does not seem to have taken the watch time of each sight" seems trivial. Peary would have done this in lower latitudes, but was a good enough navigator and astronomer to realize that such would be an unnecessary refinement where he was.

It is somewhat ironical that, because of these peculiarities in hour-angle change near the pole, it turns out that Shots 1, 2, and 4, which Peary doubtless thought best determined his latitude, have less effect on that than they do on the longitude of CJ , while Shot 3, at right angles to the others, has most direct effect on the latitude. Yet each of the other three, through its Sumner line, played an important part indirectly on the latitude, and enables us to judge how close Peary came to the pole on his poleward sledge trip between Shots 3 and 4. It is indeed fortunate that clouds did not prevent Peary from taking Shot 3 and then making the 8-mile sledge trip between Shots 3 and 4, for Shot 3 was all-important in locating CJ about 4 miles from the pole in the direction of Bering Strait; without it, some legislative caviller could have insisted that CJ was much farther from the pole and that Peary did not come near the pole on either of his sledge trips.

It was with very considerable hesitation that weight 4 was finally assigned to Shot 2. The uncertainty here lies not so much in the fact that a value of the index correction has been supplied as in the fact that the distance of CJ' from CJ is not known with all precision.³ The assumption that Peary sledged a distance quite close to 10 miles is, however, a highly reasonable one. Multiplying the indicated shifts by the weights in the case of Shots 1, 2, and 4, we then find that CJ was about 0.8 mile toward Cape Columbia from the line of the 160° meridian, while Shot 3 places the latitude of the camp at $+89^\circ-55'6''$.

With regard to this re-reduction of Peary's observations near the pole, the author desires at this point to express his sincere appreciation of helpful advice and suggestions which have been generously tendered by Messrs. Mitchell and Duvall; their own reductions of Peary's observations are, with their permission, combined with the author's in Table 3. A least

Let us assume, by way of illustration, that Peary's watch had an uncorrected error of half an hour. The maximum error that could be thus introduced for a position $4'$ from the pole would be about half a mile!

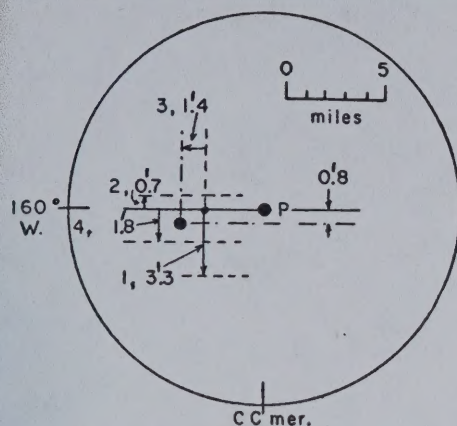


FIG. 5.—GRAPHICAL MULTIPLE SUMNER FIX OF PEARY'S OBSERVATIONS NEAR THE POLE

squares reduction by Mitchell and Duvall, using Curtis' starting data, gave values very close to his, namely, $+89^{\circ}-55'.5 \pm 1'.0$; $148^{\circ} \text{ W.} \pm 9^{\circ}$.

The writer's thanks are also recorded here for numerous helpful suggestions made by Professor Hobbs, of special value because of his close acquaintance with Admiral Peary and his familiarity with the details of polar exploration.

We then reach the conclusion from the calculations of this paper that Peary sledged within about 0.8 mile of the pole on his second sledge trip; more than this cannot be derived from the observations. Had we assumed (as is equally probable) that the index correction to be supplied in Shot 2 was 3' instead of 2', for example, and further that the sledge journey to *CJ'* was about 8.5 instead of 10 miles, we would find that Peary's second sledge trip passed within 100 feet of the pole, perhaps actually over it. While such speculations are, of course, futile, since we cannot add such to the astronomical data as recorded, this may serve to emphasize the slight and not improbable changes in the data that are needed to assume that Peary passed exactly over the pole.

The graphical Sumner fix for the four polar shots is given in the small diagram included as Fig. 5; a closely similar diagram is given by Hinks and Wordie (*loc. cit.*, 258).⁴

Possible improvements, past or present.—Three limitations or conditions had to be met by Peary:

(a) He spent but 30 hours at the pole. The return journey of 413 miles to Cape Columbia lay ahead of him and this might well be more hazardous than the trip north due to the advancing season, with the opening up of new ice-leads difficult to cross; his colleague Marvin, head of one of the supporting parties, was drowned in such a lead on his return journey (unless, indeed, he was shot by his own Eskimos; cf. Hobbs, *Peary*, p. 347). Peary had to start back promptly or run the risk of remaining permanently.

(b) The position of *CJ* must be deter-

TABLE 2 RE-REDUCTION OF PEARY'S OBSERVATIONS NEAR THE POLE

| | Shot 1 | Shot 2 | Shot 3 | Shot 4 |
|--------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|
| GAT time | 4 ^h -37 ^m .5 | 16 ^h -27 ^m .6 | 22 ^h -27 ^m .7 | 4 ^h -27 ^m .7 |
| GAT arc | 69°4 | 246°9 | 336°9 | 66°9 |
| Long. | 160° W | 126°7 E | 160° W | 160° W |
| App. T. at site, <i>t</i> | 269°4 | 13°6 | 176°9 | 266°9 |
| Approx. local time at site | 6 A.M. | 1 P.M. | Midn't | 6 A.M. |
| Lat. <i>L</i> | $+89^{\circ}-57'$ | $+89^{\circ}-49'.6$ | $+89^{\circ}-57'$ | $+89^{\circ}-57'$ |
| Sun's dec. <i>d</i> | $+6^{\circ}-23'.3$ | $+6^{\circ}-34'.5$ | $+6^{\circ}-40'.2$ | $+6^{\circ}-45'.8$ |
| <i>L-d</i> | $83^{\circ}-33'.7$ | $83^{\circ}-15'.1$ | $83^{\circ}-16'.8$ | $83^{\circ}-11'.2$ |
| log cos <i>L</i> | 6.94085 | 7.48076 | 6.94085 | 6.94085 |
| log cos <i>d</i> | 9.99729 | 9.99714 | 9.99705 | 9.99696 |
| log hav <i>t</i> | 9.70349 | 8.14673 | 9.99968 | 9.72184 |
| log hav <i>X</i> | 6.64163 | 5.62463 | 6.93758 | 6.65965 |
| nat hav <i>X</i> | 0.00044 | 0.00004 | 0.00087 | 0.00046 |
| nat hav (<i>L-d</i>) | 0.44394 | 0.44124 | 0.44149 | 0.44068 |
| nat hav <i>z</i> | 0.44438 | 0.44128 | 0.44236 | 0.44114 |
| <i>z</i> | $83^{\circ}-36'.8$ | $83^{\circ}-15'.4$ | $83^{\circ}-22'.8$ | $83^{\circ}-14'.4$ |
| Calculated alt. | $6^{\circ}-23'.2$ | $6^{\circ}-44'.6$ | $6^{\circ}-37'.2$ | $6^{\circ}-45'.6$ |
| <i>H₀</i> | $6^{\circ}-26'.5$ | $6^{\circ}-45'.3$ | $6^{\circ}-35'.8$ | $6^{\circ}-47'.4$ |
| Indicated shift to or from sun | 3'3 to | 0'7 to | 1'4 away | 1'8 to |
| Weight | 1 | 4 ?? | 4 | 4 |

TABLE 3 POSITION OF CAMP JESUP

| | Curtis | Mitchell and Duvall | |
|-----------|----------------------------|-------------------------------|---|
| | (Shots 1, 2, 3, and 4) | Rome paper (Shots 3 and 4) | Recomputation (Shots 1, 2, 3, and 4) |
| Latitude | $+89^{\circ}-55'.6$ | $+89^{\circ}-55'.4$ | $+89^{\circ}-55'.5 \pm 0'.6$ |
| Longitude | $150^{\circ} \pm \text{W}$ | 137° W | $143^{\circ} \text{ W} \pm 6^{\circ}$ |

mined.

(c) Sledge trips must be made from *CJ* so as to pass as nearly over the pole as was practicable.

Our first question is then, *given the above conditions*, could Peary, in 1909, have done better? The answer must be, No. It is not difficult to think of other procedures. He might, for example, have remained continuously at *CJ* and taken altitude sights (given unclouded skies) every two or three hours, that the armchair explorers could subsequently solve by least squares and so locate the camp with considerable precision. But he could not then have made his sledge trips to pass more nearly over the pole. Nor is any other type of astronomical observation so efficient at the pole as the method he employed.

A second question naturally arises, *given the above conditions*, could we, in 1939, do any better, using such modern instrumental adjuncts as the radio and the sun compass? Here again, in the opinion of the writer, the answer must be, No. Any other answer involves the negation of one or more of the given limitations. It is true that an airplane could now drop him at *CJ* and afford him a longer sojourn there; perhaps, also, a time of arrival could be selected when the moon at first quarter could have been used, so that the Sumner lines from both sun and moon, nearly at right angles, could be used to fix the co-ordinates of the camp in two directions. But while the radio time signal and the sun compass would have been of great service in steering the course on the

way north, they could add little to the observations near the pole. Nor has any more modern navigational method been devised that would replace the Saint-Hilaire altitude shifts.

All in all, the writer, as a result of his examination of Peary's work near the pole, is far more impressed with what Peary did than with what he left out. His journey north and his dynamic activity for the 30 hours spent near the pole form a *tour de force* with few if any parallels in the annals of exploration. It seems impossible to plan any procedure more adequate than that actually used by Peary, and it is the measured judgment of the writer that Peary sledged within about three-quarters of a mile of the earth's true pole, and perhaps even actually over that unmarked and quasi-imaginary point on the shifting ice floes of the Polar Sea.

* As a necessary adjunct to the work of exploration, Peary and his companions, as well as his Eskimos, had become very expert in estimating the distances traversed in sledge trips. It was his custom to get estimates of distance from all the members of a party, white and Eskimo alike, and then to take the average.

⁴ When but two Saint-Hilaire sights are available, the fix may be found either graphically or through a simple arithmetical process with the aid of Table 47 or Table 48 of Bowditch. Where more than two sights are available, practically the only method of convenient solution is the graphical one, through a diagram similar to the one mentioned above. The method is an old one and has always been used for multiple fixes in connection with Saint-Hilaire sights; Peary, since he used the pole as his dead-reckoning origin, doubtless carried it in his head, as shown by his course of action, or he may have made the roughest of sketches on a scrap of paper as a mnemonic aid.

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